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Electrical World

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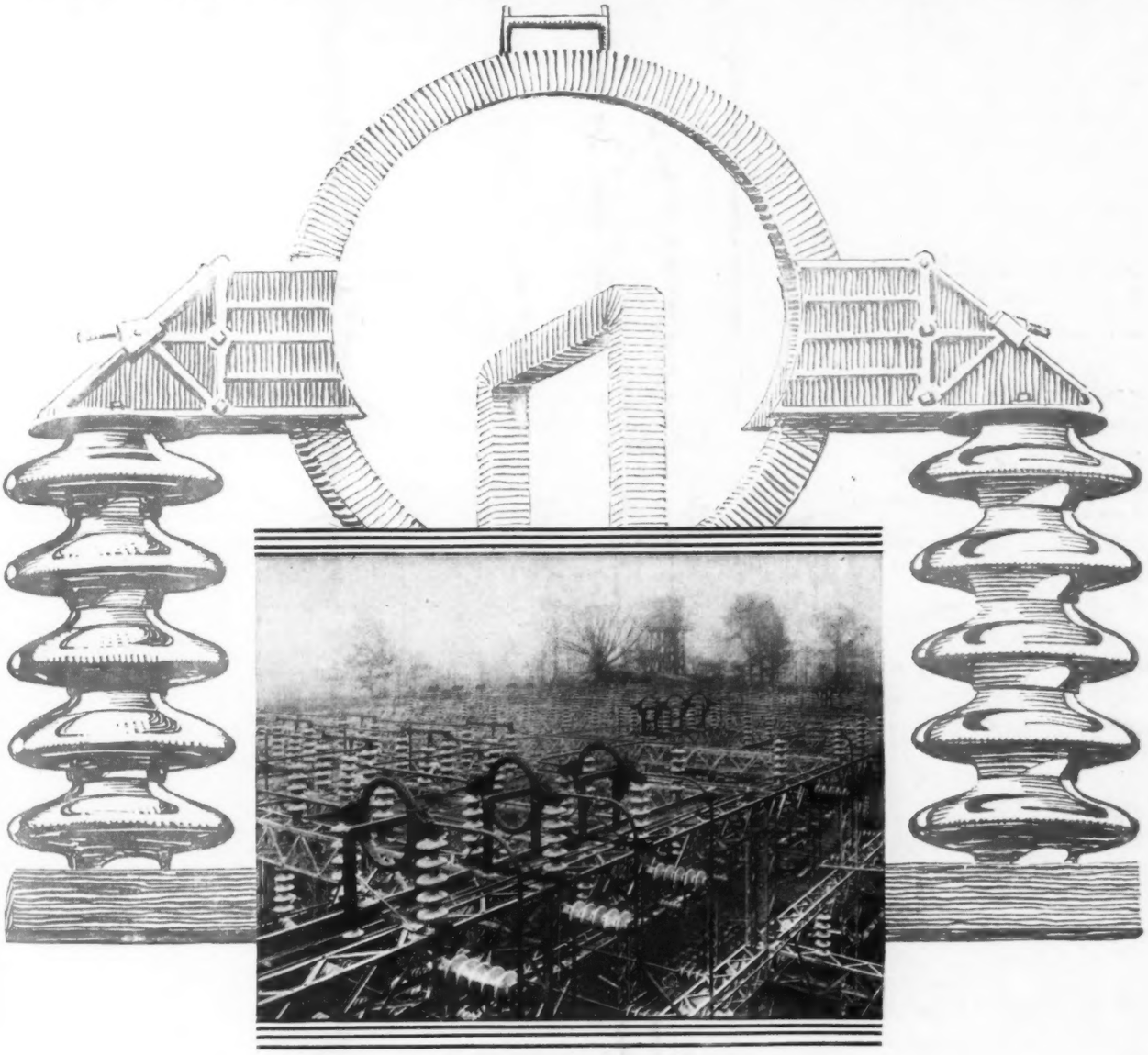

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Electrical World

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W. H. ONKEN, JR. Editor

HAROLD V. BOZELL Editor

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Lloyd George Makes Electricity a Political Issue

THE Liberals of Great Britain with the aid of Lloyd George have discovered the great advantages of electricity and have made it a political issue. Realizing that the old political slogans of their party made no appeal to the younger generation, the younger members of the party, with Lloyd George as their chief supporter, tackled the problem of the coal industry, where for years strikes and discontent prevailed. For six months a committee has been at work collecting information and drafting a report. The latter has just made its appearance. It sells for the modest price of a shilling and is today one of the "best sellers" in England.

The report makes no less sweeping a recommendation than that the Liberal party shall put at the forefront of its program the task of guiding aright the new industrial revolution which Great Britain faces in the substitution of electricity for steam. It sees in this substitution better housing conditions, cleaner cities, better conditions of labor and a general higher standard of living. Electricity therefore must be produced in England on the greatest possible scale and in the most economical manner. No vested interests must be permitted to stand in the way of such development. Private enterprise, however, says the report, must direct the creation and distribution of this new power. The state on its part must perform regulating and coordinating functions. In other words, Lloyd George proposes to adopt the American system of regulation, adapted to British conditions and limitations, and in that he has our best wishes.

Harmful Effect of Politics on Regulation

OUT in Idaho the state regulatory commission has just issued a "show cause" order indirectly assailing electric rates which the commission itself had fixed after four years of investigation. This order, which threatens to disturb conclusions reached at such substantial expense to the ratepayers and the company involved, is said to have been politically inspired. It presents the unusual picture of a regulatory body indirectly attacking its own findings.

Particularly significant is the dissenting opinion of one member of the Idaho commission vigorously condemning the procedure followed by his colleagues and voicing the conviction that, under such circumstances, the commission "has forfeited any right to be considered seriously except as a necessary stopping place on the way to the courts." Even the superintendent of a large municipal light and power system in Washington State who was called in as an expert, and who might reasonably have been expected to turn in a report adverse to the company, commended the utility upon the efficient operation of its property and said that, from a rough comparison with the rates charged by the municipality he represented, it was evident that the customers of the Idaho company were not being overcharged.

Politics and reasonable regulation, justice and uninformed prejudice, oil and water, cannot and will not mix. Here is one more argument for placing regulatory commissions on the highest possible plane of ability and freedom from timeserving. If the commissions are to be maintained as efficient mediums for the determination of fair rates, the men who compose them must have backbone and be able to impart to their decisions the same weight that attaches to the deliverances of the judges of a comparable court.

Indiscriminate Purchases of Properties Should Be Discouraged

THE present feverish activity in buying and consolidating electric public utility properties calls for some restraining influence on the part of the larger companies. Not that consolidations should be discouraged, but that the indiscriminate throwing together of "cats and dogs," with its evil consequences, should be checked. If executives and operators will look upon the electrical industry as a great national institution, and one which because of its many ramifications is destined to become the controlling institution, they will have a clear conception of their duty in the present circumstances.

During the decade from 1900 to 1910, when holding companies in the electric public utility field enjoyed their most active growth, the same lack of discrimination was shown at times in acquiring properties. Small isolated plants were bought in various states so far apart that there was no possibility of interconnections or of operating economies. As a consequence it required years of study and investigation, with the purchase of some properties here and the sale of other properties there, before a logical and workable group of utilities was evolved by the holding company. With electric public utilities in popular favor, missionaries are going through the country buying and selling them. Not all of these fall into proper hands, but that is of no consequence to speculators. Where a number of contiguous electric public utilities are tied together, it is only natural that they should expand; but it not infrequently happens that expansion is checked owing to the presence of an isolated system belonging to some holding company. It then becomes necessary to trade one property for another, if that be possible, or else pay a stiff price for the isolated system.

Holding companies are of two types, one with a number of isolated properties over which the holding company exercises supervision and another in which the

properties are contiguous and tied together. Both types of holding companies can justify themselves, but the one which shows best results in practice is the latter; for, over and above the advantages accruing to the other type, it possesses the added advantage of being able to shut down uneconomical stations and erect a super-station to feed the entire network. This type should be encouraged to expand until further expansion becomes uneconomical.

Insulation Tests of Transformers

THE problems of insulation arising in the advance to 220 kv. are principally those of the line insulator and the transformer. As between these the line insulator as yet appears to be the less reliable. Technical literature during the past year or so has contained many papers describing experiments and tests in the further development of line insulators. The principles underlying their performances do not appear to be as well understood as those pertaining to the transformer, and literature in connection with the latter appears to be limited to descriptions of large units and statements of manufacturers that practically all conditions demanded by large projects may be met. At first glimpse this contrast between the line insulator and the transformer appears to be remarkable because the latter is a far more complex apparatus, involving an enormous area of surface of dielectric exposed to high-voltage stress. On the other hand, and this is the explanation of the existing condition, the line insulator is exposed to highly erratic weather conditions and variations of demand upon its mechanical strength and structure.

However, all has not been plain sailing in the case of the transformer. The high values of voltage stress have required corresponding care and attention in selection of insulating materials, and particularly have increased the length of puncture and creepage paths within the structure, thus causing increases in over-all dimensions. In order to conserve both space and cost, it is usual in these transformers to grade the insulation between coils, and between coils and core, to the actual existing stresses of the several portions of the windings. The grounded neutral invariably associated with 220-volt transmission results in a difference of potential between winding and core, increasing uniformly from zero at the neutral to a maximum at the line terminal. With such graded insulation it is obvious that a single value of insulation test voltage cannot be applied to the entire winding. Consequently, the insulation test is applied as an induced voltage. In order that this voltage may be increased without increasing the magnetic flux density, an increase of the frequency of the test voltage must be made, this increase being practically in proportion to the increase of the test voltage over the normal value.

A difficulty has been met, however, in the fact that built-up insulation will withstand a fixed value of voltage for shorter and shorter intervals of time as the frequency is increased. As a result of this insulation tests, with a time of application based on the regulations for 60 cycles, impose an excessive strain if they are made by means of induced voltage at frequencies say from three to four times normal. Interesting data on these variations with the frequency in the behavior of insulation are offered in a paper by F. J. Vogel in the July *Journal of the A. I. E. E.*, in which a proposal is made of the amount by which a 60-cycle one-minute test should be shortened in time when the insulation test is by induced voltage at higher frequencies. For example, for equivalent voltage tests at 60, 120, 240 and 360 cycles, the durations of applications proposed are 60, 44, 21 and 11 seconds respectively. Such a proposal will undoubtedly go far to remove the undue stresses upon insulation whose properties are well understood and under control. At the same time it should be pointed out that the tests on which the recommendations are made present wide variation, and it is certain that not all types of insulation will obey the same empirical law of variation with the frequency. A comparative study of a wide variety of materials would appear very desirable.

X-Rays and the Atomic Structure of Matter

AT THE recent meeting of the American Physical Society, held at the Bureau of Standards in Washington, the attention of the members was centered, as attested both by the number of papers presented and by the interest manifested, on the study of various radiations, especially X-rays, as indicators of intra-atomic structure. After the revolutionary discoveries of Roentgen, Curie, J. J. Thomson, Planck, Bragg, Einstein and others, physicists were for a time overwhelmed by the superabundance of new puzzles and of powerful new methods of analysis offered by these discoveries. Now, after several years of diligent work by experimenters and theorists of lesser magnitude, these new additions to our knowledge of nature begin to be co-ordinated, and various methods are brought to bear upon the same fundamental problem, viz., that of the structure of the atom and of aggregates of atoms.

At the present time X-rays seem to offer the most promising method for the study of the structure of the atom, and many investigators employ them to cause atoms to "speak for themselves." Assuming the atom to consist of a positively charged central nucleus and of negative electrons, an electromagnetic pulse, such as an X-ray, communicates to these electrons a certain amount of energy. Under certain conditions this energy may be transformed by an electron into a pulse of different frequency, giving rise to the so-called secondary X-rays. It is the study of these secondary X-rays that occupies the attention of many physicists, since their properties are indicative of the properties of the atoms emitting them. Fortunately, two convenient methods are available for measuring these weak secondary radiations, namely, the ionization chamber and the photographic plate. It is one of the signs of the times that this particular problem is being studied by a large group of investigators, scattered geographically, who interchange their views and results at frequent intervals, thus keeping a balance of sanity, avoiding duplication, and giving a good promise that this particular method of study of the atomic structure will soon be "sucked dry" and shoved out of the way to give place to still another method which will permit an attack on the problem from a new angle.

In the seventy-seven papers presented at the meeting the word "ether" does not occur once. In fact, a physicist mentioning the ether would feel himself quite

old-fashioned and out of place. However, having done away with ether, physicists have not yet substituted anything in its place to account for the mechanism of electromagnetic waves, light, X-rays, etc. For the time being, they seem to take these radiations as an entity and simply use them as a tool to penetrate into the mystery of the atom. Perhaps another genius is needed to provide a starting place in the understanding of the mechanism of energy transmission through space by means of electromagnetic waves.

International Electrotechnical Commission Ratings of Generators and Motors

IT WILL be remembered by those of our readers who have followed the rulings adopted by the International Electrotechnical Commission that the international rating of a dynamo-electric machine, insulated with class A material of the usual prepared cotton, was the steadily maintained output which it could furnish without exceeding a temperature elevation of 50 deg. C. at the warmest accessible point. That is, its rating, so far as concerned thermal limitations, was the continuous output which, starting from an assumed initial and ambient temperature of 40 deg. C., would not permit it to exceed 90 deg. C., as measured in a definite way during the test. This ruling met with international agreement and support until the last meeting save one of the I. E. C. rating committee at Geneva in 1922. At that meeting a proposal was made to change the rule, in view of the prevalent tendency in some parts of the mercantile world of dynamo-electric machinery to buy and sell on a basis of 40 deg. C. steady output rise from an initial and ambient temperature of 30 deg. C., followed by an overload of 25 per cent for two hours, with a final observed temperature not exceeding 90 deg. C.

The original 50 deg. C. rise rule was not changed at the Geneva meeting, but a considerable amount of discussion and difference of opinion was initiated as a result of the new proposal. Most of the countries represented were in favor of maintaining the original 50 deg. C. rise rule, without overload specification, mainly on the pleas of simplicity and definiteness of international understanding.

At the London meeting of the I. E. C. rating committee last July an unofficial session was devoted to a free discussion of this important question. It was found that no country now desired to introduce an overload specification into the I. E. C. rules, although it was pointed out that any country was free to incorporate such an overload specification in its own local national rules. This universal understanding to adhere to a simple continuous-load temperature elevation greatly simplifies the situation. The only outstanding point for discussion is whether the international I. E. C. rating should be based on a steady output for 50 deg. C. rise or for some other rise, such as 40 deg. C.

If a machine was found to be capable of giving a continuous output of, say, 40 kw. without exceeding 50 deg. C. rise, then it might be capable of giving a continuous output of perhaps 34 kw. without exceeding 40 deg. C. rise. In the former case, which is the original and still unchanged I. E. C. rule, its international rating would be 40 kw., whereas in the latter case it would be only 34 kw. It would evidently have more margin for meeting severe or irregular service conditions if rated as a 34-kw. machine, but, on the other hand, it would become a relatively heavier and costlier machine per kilowatt of rated output. As a basis of international test comparison, the 40 deg. C. rise rule would, however, be as definite and fair for everybody as the present 50 deg. C. rise rule. A purchaser familiar with the business, or technically informed, would presumably know in either case how to operate his machine economically and safely. He would know that he could more often safely apply a load in excess of the rating with a 40 deg. C. rise ruling than if the present 50 deg. C. rise ruling remained in force.

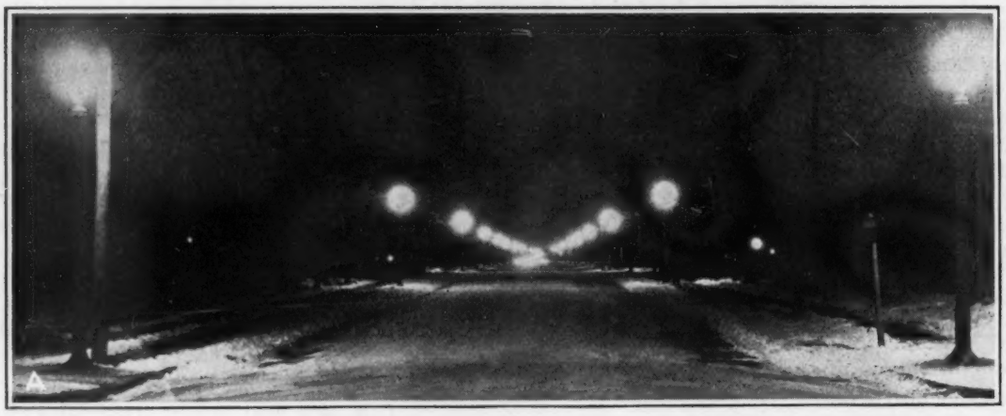
There is one argument, however, for maintaining the present 50 deg. C. rule, and that is the credit of electrical engineering construction all over the world. During the last forty years the science and art of dynamo construction have advanced considerably and have markedly increased the reliable output per kilogram, or per dollar, of machine. The larger the number of watts per kilogram, or of watts per dollar, consistent with safety and durability of operation, the greater the progress and achievement. Every one probably will admit that 50 deg. C. rise above an initial and ambient temperature of 40 deg. C. can be safely maintained for an indefinite period with ordinary care and supervision. Still more surely can 50 deg. C. rise be maintained from the more usual ambient temperature of 25 deg. C. Consequently, it is only fair to the business of dynamo manufacture to maintain the international 50 deg. C. rating rule, and there does not seem to be any reason of sufficient importance for changing this to 40 deg. C., with the disparagement to the art of construction thereby implied. It is to be hoped, therefore, that when the rule is next considered officially by the rating committee of the International Electrotechnical Commission the present 50 deg. C. continuous-rise rule will be sustained.

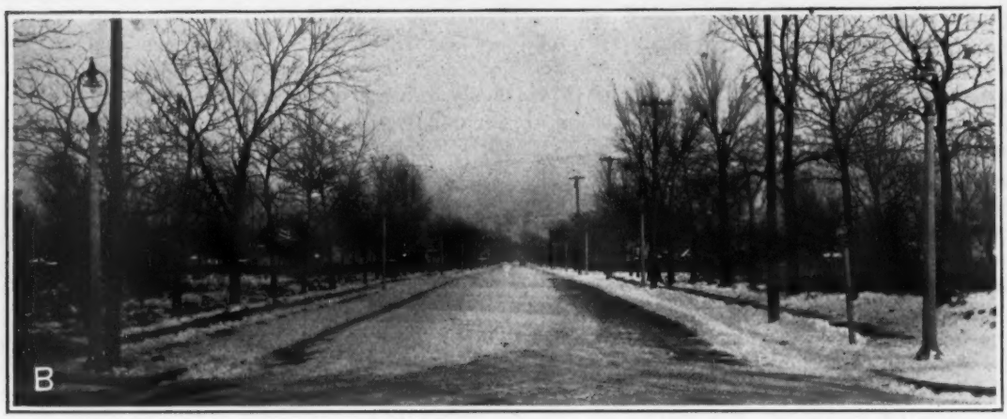
Keep the Lighting Contest Above Suspicion

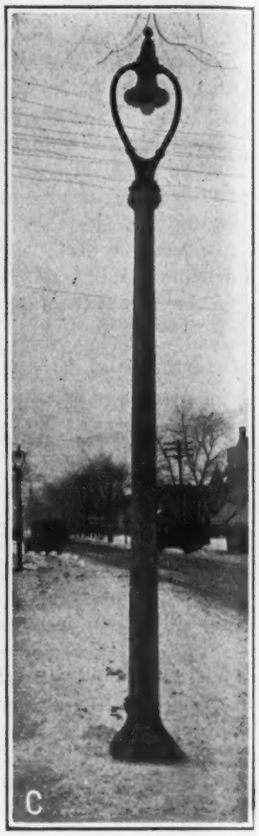
IN THE organization of the national campaign of the Lighting Educational Committee and the development of the many local essay contests among school children which will be a part of it the utmost care should be taken by every one co-operating in the movement to keep the whole affair above suspicion. Before all else, the purpose is educational. It is not a selling campaign. And it would be most unfortunate if in any city the idea should spread abroad that the electrical industry is trying to take improper advantage of the public, private and parochial schools to promote its business.

True, the influence of this campaign will inevitably bring great benefit to electrical men in every community where a contest is put on, but this will come naturally because the keen interest of the school children in studying the lighting at home and in the homes of friends will focus attention on much poor lighting that now exists and which their parents, once they realize it, will desire to improve. But if the lists were taken by central stations, or manufacturers, or jobbers and dealers and used for direct selling or for advertising by mail, the people would very properly resent it and the contest would be a boomerang.

There is always the danger that some enthusiast will go too far in such a situation. It should be carefully guarded against. For this campaign has a worthy purpose and should be held high above suspicion.







Street-Lighting System Designed to Harmonize with Architectural Character of Residential Streets

THE street-lighting system installed in Maywood, a suburb of Chicago, although rather expensive at the start, is exceedingly economical to maintain. The initial cost per mile was $7,290, including an extensive underground duct system. The lamp spacing is 165 ft., with a staggered system, and the height of lamp posts is 13 ft., so as to obtain uniform flux distribution upon the sidewalks and streets. A harp fixture was specified rather than using an inclosed globe, because the time necessary for cleaning one reflector and one lamp is much less than that required for cleaning bowl-inclosed units. With a bowl-enameled lamp the harp fixture provides sufficient diffusion to avoid glare. The reflector is constructed of heavy porcelain and, with the lamp operating on 6.6 amp. and yielding a candlepower of 250, the flux density distribution may be taken from A. A daylight view of the same location is given in B. A close-up view of the octagonal concrete posts and the harp-type fixture is shown in C. Details of a pole base transformer installation and method of soldering leads are shown in D and E.

Maywood Street-Lighting System

Complete Installation of 1,784 Lamps with Individual Disconnecting Transformers in Base of Posts Costs $270 per Lamp—360-Kw. Compact-Ring Bus Substation Serves Twelve Circuits for Suburb of 12,000 People

By F. WOODMANSEE
Woodmansee-Davidson Engineering Company, Consulting Engineers, Chicago

IN MAYWOOD, a suburb of Chicago with a population of 12,000, there was installed last September one of the most complete residential street-lighting systems in the United States. It involved the erection of 1,784 posts for incandescent lamps. The outstanding features of this series type of street-lighting installation are (1) the compact design of the substation, (2) the completeness of the underground duct system, (3) the use of individual disconnecting series transformers mounted in the base of the pole itself.

Although only twelve circuits are now in use, totaling 360 kw., the substation has ample capacity to allow the lighting load to expand to 800 kw. The main thought behind the design of the entire lighting installation was to insure complete harmony with the buildings and surroundings in this high-grade residential suburb. The Board of Trustees of Maywood desired an installation which would require minimum maintenance expense, because such charges are paid from the general expense fund, while the initial cost could be paid by a special assessment. Therefore the trustees thought it advisable to install a system which, while more expensive at the start, would be economical to maintain. For this reason an expensive underground duct system was installed which finally resulted in a total cost of $7,290 per mile of street lighted.

A spacing distance of 165 ft., using a staggered system, was chosen in the main residential section in order to provide sufficient light for automobile traffic. For the business district it was necessary to obtain a much higher distribution of light. Accordingly the lamps were placed about 65 ft. apart. These circuits were made as short and direct as possible. The necessary runs to reach the lamp posts were made on the secondary side as shown in Fig. 1.

Energy is obtained from the Sanitary District of Chicago, which brings a 12,000-volt underground line into the 360-kw. substation at Sixth Avenue and St. Charles Road, Maywood. The route of this 12,000-volt cable from the Sanitary District's terminal at the corner of First Avenue and Roosevelt Road is northward to Ninth Street, then westward to Sixth Avenue, and northward to the substation, where it is transformed down to 4,000 volts. The ground-line plan of this substation, showing both the incoming and outgoing cable ducts, is presented in Fig. 2. Here, in a space 45 ft. x 19½ ft. (Fig. 4), is contained all the outdoor control-switching equipment that is used in serving the lighting and pumping plants of the Maywood district.

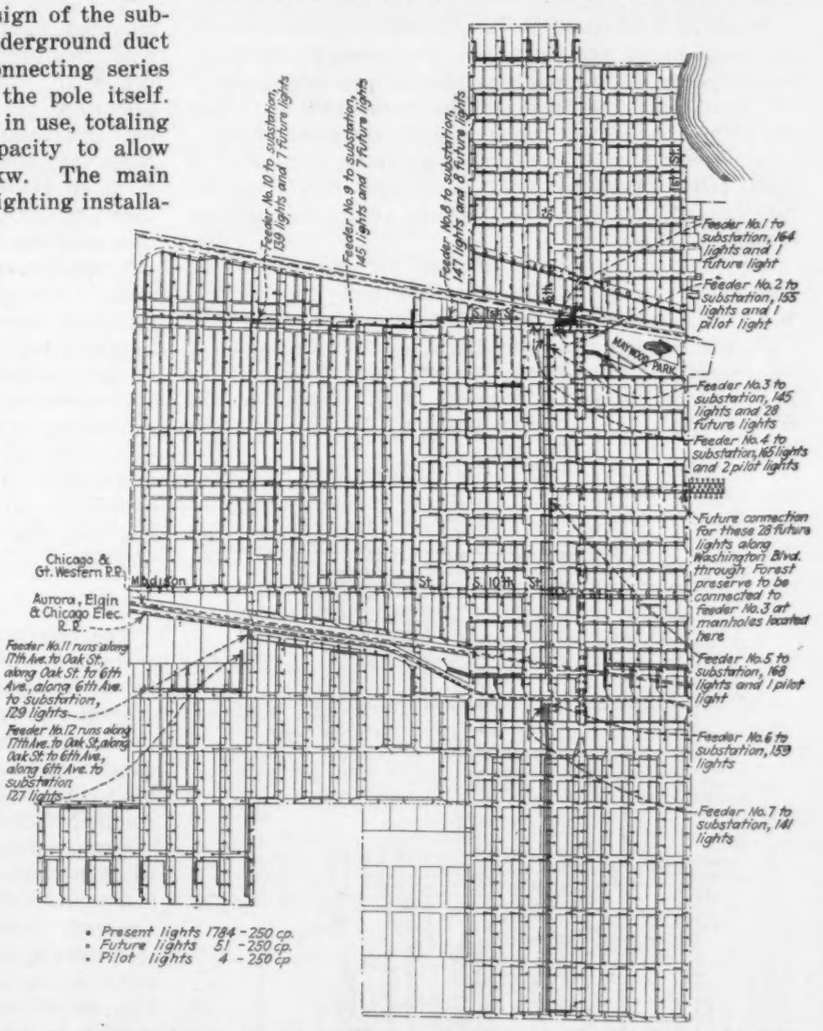

Feeder No.10 to substation, 139 lights and 7 future lights
Feeder No.9 to substation, 145 lights and 7 future lights
Feeder No.8 to substation, 147 lights and 8 future lights
Feeder No.1 to substation, 164 lights and 1 future light
Feeder No.2 to substation, 155 lights and 1 pilot light
Feeder No.3 to substation, 145 lights and 28 future lights
Feeder No.4 to substation, 165 lights and 2 pilot lights
Future connection for these 28 future lights along Washington Blvd. through Forest preserve to be connected to feeder No.3 at manholes located here
Feeder No.5 to substation, 168 lights and 1 pilot light
Feeder No.6 to substation, 159 lights
Feeder No.7 to substation, 141 lights
Feeder No.11 runs along 17th Ave. to Oak St., along Oak St. to 6th Ave., along 6th Ave. to substation, 129 lights
Feeder No.12 runs along 17th Ave. to Oak St. along Oak St. to 6th Ave., along 6th Ave. to substation 127 lights
Chicago & Gt. Western R.R.
Aurora, Elgin & Chicago Elec. R.R.
Madison St.
5. 10th St.
MAYWOOD PARK
• Present lights 1784 - 250 cp.
• Future lights 51 - 250 cp.
• Pilot lights 4 - 250 cp

FIG. 1—THE COMPLETE CIRCUIT LAYOUT OF THE DISTRIBUTION CABLES, SHOWING HOW THE CIRCUIT MILEAGE WAS KEPT TO A MINIMUM

In building the substation it was felt that to insure compactness and at the same time provide an auxiliary bus the construction shown in Figs. 3A and 3B was the best. Two-inch galvanized-iron pipe furnishes the supports of the substation. The top of the station proper contains the three phases and a ring bus of the neutral (Fig. 3A). From these buses the circuits drop down

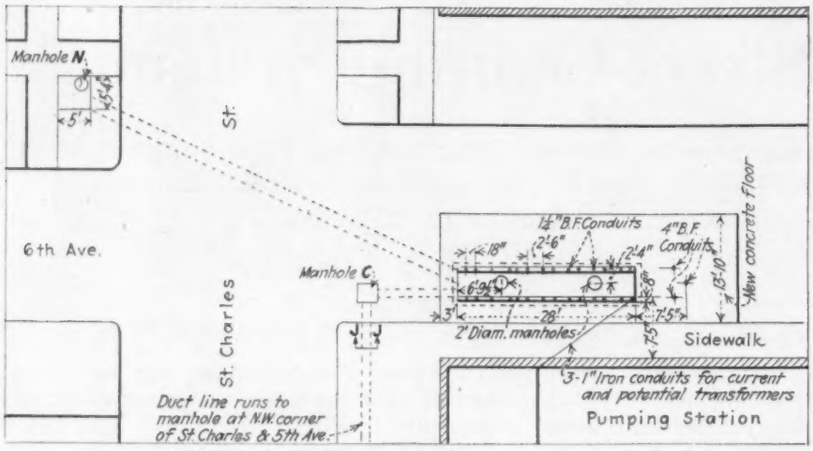


FIG. 2—THE GROUND-PLAN SECTION SHOWS THE EASY CONSTRUCTION OF THE SUBSTATION

through 30-amp. fuses to the voltage regulators. All the main buses and taps from the buses to the fuses and oil switches are made of ½-in. copper tubing, while the taps from the fuses to the regulators and from the oil switches to the cable end bells are made of No. 1 solid copper wire. The busbar supports are rated at 7,500 volts. Available space is afforded for future extensions of this substation should additional lighting circuits be neecssary.

The sectional view *BB* of Fig. 3*B* shows how the emergency buses provide for continuity of service. With the substation mounted directly over the 6-ft.-wide duct, the circuits run from the regulators through the disconnecting switches directly into the cable duct sunk in the ground below the concrete piers. From here the circuits go to the outgoing feeders. By having regulators on both the outer faces of this rectangular substation much less space was required than if they were mounted all in one single straight line. The section *CC* illustrates how the main buses are energized from the incoming line. This line comes up from the 6-ft.-wide duct through 4-in. bituminized-fiber conduit to the 200-amp., 4,000-volt oil switches and then on up to the main buses on top of the substation. Since the incoming circuits also feed the pumping load of Maywood, the 200-amp., 4,000-volt oil switches on the top of the substation are also employed as bus-sectionalizing switches. Although the substation is very compactly built, a space interval of 18 in. is kept between buses for safety. All the oil switches mounted in this substation are operated as a unit from the ground by means of a 180-deg. mechanism. While all this equipment is installed out of doors, provision is made for the installation of recording instruments within the main pumping station. Both the current and the potential transformers are mounted below the main top buses. The circuits for these recording instruments run through three 1-in. iron conduits into the station. Because of the fact that this substation was built in the street over an old sidewalk, it was necessary only to construct a concrete base for about three-quarters of the foundation. The manner in which the circuits were run into the substation may be determined from the schematic diagram (Fig. 5). It is shown here where the spare feeder served as a bus-connecting switch between the main and emergency bus. Continuity of transformer service is guarded by the installation of a duplicate set of transformers. The method of numbering the circuits on one side as odd and even was merely followed for the purpose of ready identification of circuits.

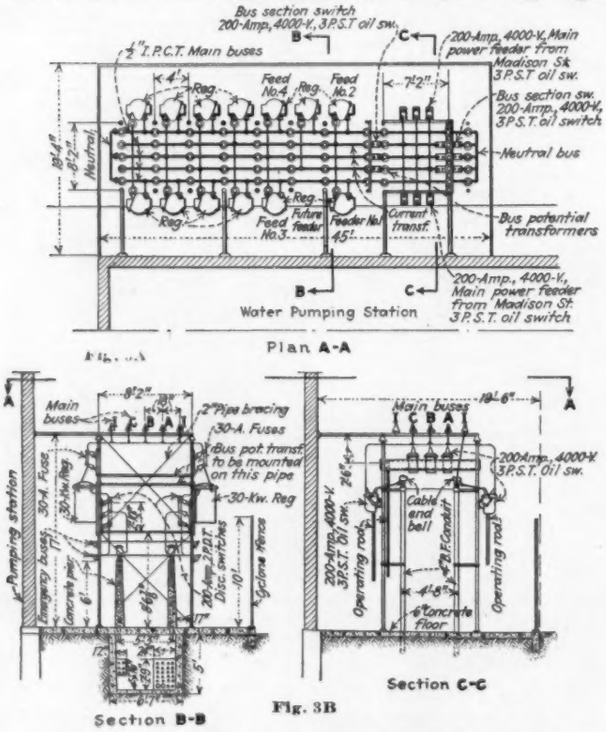


Fig. 3B

FIGS. 3A AND 3B—SUBSTATION BUILDING VERY COMPACT

Fig. 3A—Mounting the main buses directly on top of the substation facilitates the use of a common-ring neutral and affords easy connection of regulators.

Fig. 3B—Sectional views of substation, showing compact design and ease of performing switching operations.

CONDUIT-SYSTEM DETAILS

The reasons for the choice of an underground duct system, besides those above mentioned, were several. In the first place, the fiber ducts laid in concrete would prevent electrolysis, an evil commonly encountered with the use of a parkway cable. Again, there would be no danger of cutting the cable during trench excavation work for tapping water or gas mains in the street. Another factor was that a burned-out cable in a duct system can be very readily removed and replaced, whereas a parkway cable failure is difficult to locate, and would have to be dug up completely in order to be replaced. All these ducts were installed so that their tops were approximately 16 in. below the surface of the earth to avoid any danger from the cable freezing. The entire conduit system was constructed of fiber ducts with ¼-in. walls.

The duct lines illustrated in Fig. 6A indicate the extent to which the design for this street-lighting installation called for various types of handholes and manholes since each design was built to fill a special need of that type of post foundation. All of these manholes and handholes are at the elevation of the sidewalk. Where there is no sidewalk they were placed about 6 in. above the natural surface of the ground to provide for the time when sidewalks should be laid. They were

installed in this manner to prevent surface water running into the duct lines. All the duct lines drain into manholes at street intersections where sewer connections are made. Fig. 6B presents the various types of duct capacities, ranging from one to eighteen.

The trenches were dug by hand, and the entire system was installed in the parkways 3 ft. from the sidewalk in order to obviate much digging up of the pavement. A typical duct layout is shown in Fig. 7, which indicates the position of the lamp post and gives the cross-section required in the duct line itself. The alphabetical notation at the position of the lamp post and the cross-section of the duct line refer to the type of manhole and ducts illustrated in Fig. 6A and 6B. Six months' time sufficed for the entire job, and there was no blocking of traffic owing to the care taken to dig close to the sidewalk. These duct lines were planned and laid out as straight as possible in order to reduce to a minimum the primary circuit mileage. All indirect runs to lamps in odd locations were made on the secondary sides. The concrete used in the duct lines consisted of one part cement, three parts sand and five parts crushed stone. The stone used in this concrete was crushed limestone and was large enough to pass through a screen having ¾-in. round holes. Each section of concrete was poured alternately as each layer of fiber duct was placed. After all the concrete lines had been laid, the contractor was required to let them set for twenty-four hours before the earth was replaced. To insure care the contractor was held responsible for damages to the sidewalk or pavement. The entire cost of laying the circuit system was $153,441.44, as shown in the table. This brought the cost of a mile of circuit up to $2,575.24.

The main feeder cable from the manhole at First Avenue and Roosevelt Road, which brought the energy to the substation, was three-conductor No. 0 B. & S., rated at 12,000 volts. This cable has a 3/32-in. paper insulation over each conductor and 5/32-in. paper over both of them. The lead covering is 3/64-in. thick. While the primary operating lighting voltage is 4,000, both the primary and secondary conductors are of the same

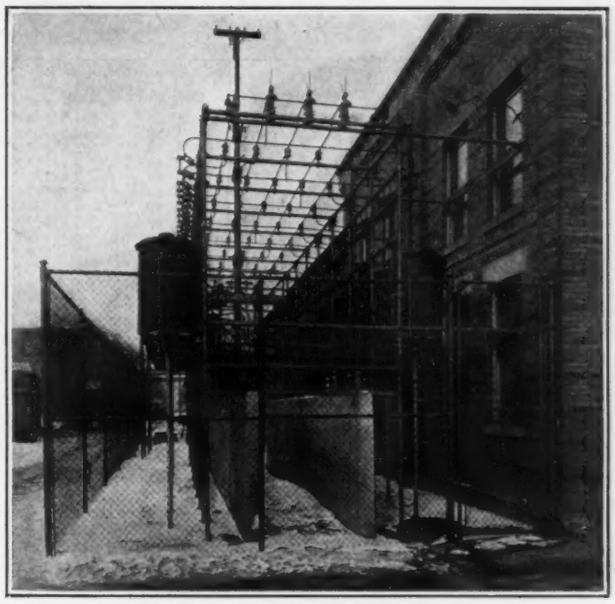


FIG. 4 — RECTANGULAR MOUNTING OF LIGHTING REGULATORS PROVIDES MEANS OF CONSTRUCTING A 360-KW. SUBSTATION IN A SPACE 45 FT. X 19½ FT.

size—No. 6 B. & S. copper wire. The difference, however, lies in the thickness of insulation. In order to obtain some factor of safety, 5,000 volts was the tension chosen for this cable. The primary circuit has 3/32-in. insulation with 30 per cent Para rubber and tape insulation with a 3/64-in. protective lead covering. The secondary conductors from the transformers, running up through the middle of the pole to the lamps, are single-conductor, No. 6 B. & S. solid wire with 1/16-in. 30 per cent Para rubber-tape insulation covered with 1/16-in. lead covering. All the cables were required to withstand the factcry test of two and one-half times the operating voltage between the conductor and the lead for a period of five minutes. After the cables were installed they were tested to a value of twice the work-

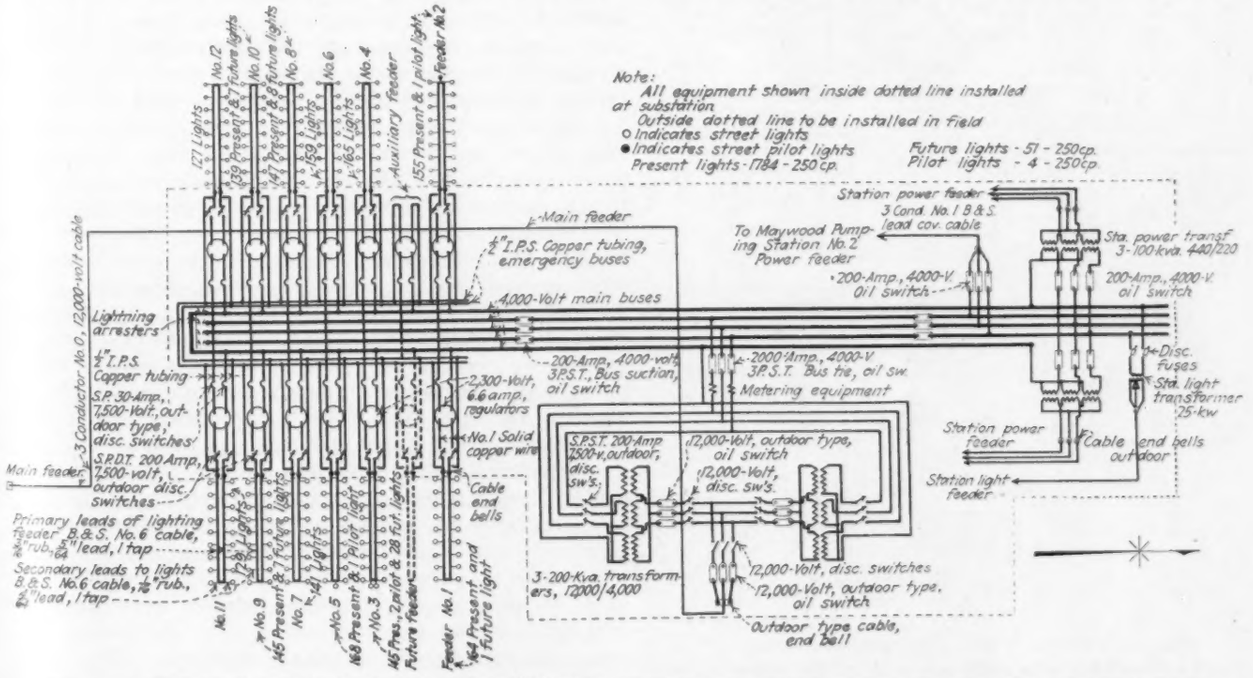

Note:
All equipment shown inside dotted line installed at substation
Outside dotted line to be installed in field
○ Indicates street lights
● Indicates street pilot lights
Present lights - 1784 - 250 cp.
Future lights - 51 - 250 cp.
Pilot lights - 4 - 250 cp.
Main feeder
½" I.P.S. Copper tubing, emergency buses
4,000-Volt main buses
Lightning arresters
½" I.P.S. Copper tubing
3 Conductor No. 0, 12,000-volt cable
S.P. 30-Amp., 7,500-Volt, outdoor type, disc. switches
S.P.D.T. 200 Amp., 7,500-volt, outdoor disc. switches
Main feeder
Primary leads of lighting feeder B.&S. No. 6 cable, 5/64" rub., 5/64" lead, 1 tap
Secondary leads to lights B.&S. No. 6 cable, 1/16" rub., 2/64" lead, 1 tap
2,300-Volt, 6.6 amp. regulators
No. 1 Solid copper wire
Cable end bells
200-Amp., 4000-volt, 3P.S.T., Bus suction, oil switch
2000-Amp., 4000-V. 3P.S.T. Bus tie, oil sw.
Metering equipment
S.P.S.T. 200-Amp. 2500-v. outdoor, disc. sw's.
12,000-Volt, outdoor type, oil switch
12,000-Volt, disc. sw's.
3-200-Kva. transformers, 12000/4,000
12,000-Volt, disc. switches
12,000-Volt, outdoor type, oil switch
Outdoor type cable, end bell
Station power feeder
3 Cond. No. 1 B.&S. lead cov. cable
To Maywood Pumping Station No. 2 Power feeder
200-Amp., 4000-V. Oil switch
Sta. power transf. 3-100-kva. 440/220
200-Amp., 4000-V. oil switch
Disc. fuses
Sta. light transformer 25-kw
Station power feeder
Cable end bells outdoor
Station light feeder
Auxiliary feeder
Feeder No. 2
Future Feeder
Feeder No. 1
No. 12
No. 10
No. 8
No. 6
No. 4
No. 2
No. 11
No. 9
No. 7
No. 5
No. 3
No. 1

FIG. 5—A SCHEMATIC LINE DRAWING OF THE SUBSTATION, SHOWING THE SPARE FEEDER SERVING THE EMERGENCY BUS

ITEMIZED LIST OF MATERIAL COSTS

UNDERGROUND DUCT SYSTEM, FT.

Material	Quantity	Unit Cost	Total Cost
Single-duct conduit	254,268	$0.36	$91,536.48
Two-duct conduit	17,942	.56	10,047.52
Four-duct conduit	9,357.13	.92	8,608.56
Four-duct conduit	7,146.80	1.21	8,647.63
Six-duct conduit	7,565.06	1 28	9,683.28
Eight-duct conduit	2,686.84	1.65	4,433.29
Ten-duct conduit	698.33	2.50	1,745.75
Twelve-duct conduit	1,327.96	2.80	3,718.29
Fourteen-duct conduit	328.50	3.40	1,116.90
Eighteen-duct conduit	722.00	4.40	3,176.80
Relaying pavement	.....	.....	8,920.22
Extra ducts on Madison Street	.....	.....	203.69
Changing conduits in bases	.....	.....	875.00
Extras due to railroad crossing	.....	.....	456.48
Small extras due to local conditions	.....	.....	271.55
Total underground ducts	.....	.....	$153,441.44

MANHOLES, HANDHOLES AND LAMP FOUNDATIONS

Type A lamp-post foundations	1,049	$5.66	$5,937.34
Type B lamp-post foundations	697	7.92	5,520.24
Type C combined lamp-post foundation and one handhole	681	13.85	9,431.84
Type D two-compartment-type handholes	92	13.36	1,229.12
Type E combined lamp-post foundation and two handholes	73	17.90	1,306.70
Type R combined lamp-post foundation and three handholes	5	24.56	122.80
Type S three-compartment handholes	58	20.76	1,204.08
Type K manhole	80	72.00	5,760.00
Type N manhole	4	135.00	540.00
Total manholes and foundations	.....	.....	$31,052.12

CABLE, FT.

Four conductor No. 3/0 B. & S. 12,000-volt lead-covered cable installed	10,625	.....	$16,656.25
Single-conductor No. 6, B. & S. 5,000-volt lead-covered cable installed, primary circuit	331,500	$0.182	60,333.00
Single-conductor No. 6, B. & S. 600-volt lead-covered cable installed, secondary circuit	245,800	.....	21,949.94
Total cable	.....	.....	$98,939.19

LAMP POSTS AND TRANSFORMERS

Material	Quantity	Unit Cost	Total Cost
Concrete lamp posts with 250-cp. type C tungsten lamps with Kuhlman series transformers, installed	1,784	74.00	$132,016.00

SUBSTATION

Excavation and concrete framework	.....	.....	$800.00
200-amp., 4,000-volt oil switch, triple-pole, single-throw, operated from ground	3		
Four-phase outdoor cable and bells	2		
Single-phase, 30-amp., 7,500-volt outdoor disconnecting fuses	26		5,677.00
Single-phase, double-throw, 200-amp., 7,500-volt outdoor-type disconnecting switches	24		
Single-phase lightning arresters, 4,000 volts	4		
Single-phase outdoor end bells for primary leads	24		
Current transformer	3	Furnished by Sanitary	
Potential transformers, 2,300/115-volt	3	District of Chicago	
30-kw., 2,300-volt primary, 6.6-amp. secondary, constant-current G. E. regulators	7	.....	4,200.00
25-kw., 2,300-volt primary, 6.6-amp. secondary, constant-current G. E. regulators	6	.....	3,600.00
Extra angle irons	.....	.....	44.83
Change in leads to regulator	.....	.....	159.14
Additional supports	.....	.....	258.93
Removing pole equipment	.....	.....	84.56
Total substation costs	.....	.....	$14,824.46

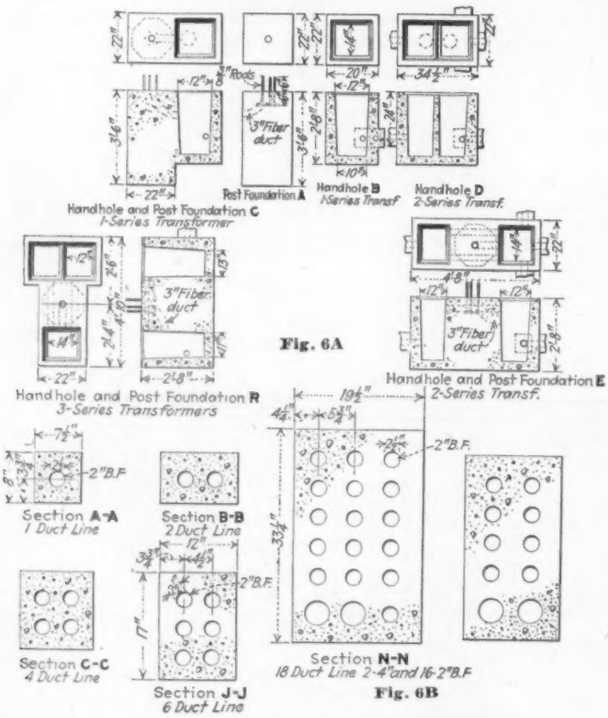
TERMINAL POLE

Western red cedar 40-ft., 9-in. top	1		
Single-phase lightning arresters, 4,000 volts	4		
Choke coils, 200-amp., 4,000-volt	4	.....	$1,058.00
200-amp., 4,000-volt, four-phase single-throw oil switch operated from ground	2		
Four-conductor 12,000-volt outdoor cable end bells	2		
Total labor and material	.....	.....	$431,331.21
Engineering	.....	.....	22,566.56
Legal expense of 6 per cent for spreading and collecting assessment	.....	.....	27,233.89
Total installation	.....	.....	$481,131.66

ing voltage between the conductor and the lead for a period of five minutes, operating at a normal frequency of 60 cycles.

No difficulty was encountered in the jointing of these cables, as the standard methods normally employed by electrical utilities on such low-voltage installations were employed. However, care was taken to see that the temperature of the petrolatum was high enough when pouring in order to avoid the formation of air spaces in the joints.

This installation is one of the first to include a large number of transformers of the individual disconnecting type mounted in the base of the lamps themselves. These were furnished by the Kuhlman Electric Company of Bay City, Mich. They were chosen to permit ease in disconnecting the lamp from the primary circuit. Should there be trouble with a transformer or a test be desired, the primary connection plug can be pulled out and reinserted in a sleeve, and the main circuit will go on functioning. Three minutes will suffice for this. This connection plug and socket are self-centering, so that a perfect connection is always obtained. Because of the connecting sleeve the transformer is always watertight, thereby allowing the transformer to operate in the base of a post or when buried without any protection in the ground. This joint also obviates the need of wiping cable connections and of obtaining competent cable splicers to do this work. The lead cable is soldered to this connector, which can be handled by ordinary electricians. These transformers, together with the disconnecting sleeves, have withstood all water-submerged tests at 10,000 volts. By placing them in the base of the pole itself wherever possible, installation costs have been materially lowered as compared with apparatus requiring a complete underground manhole for each lamp. The transformers are of the standard 6.6-amp., constant-series type, having a single conductor of No. 6 B. & S. rubber-insulated lead-covered cable. The primary circuit runs directly to the 250-cp. tungsten lamp up through the center of the pole. The core and coils of the street transformer are installed in a welded galvanized-iron case which is so constructed as to be waterproof. The transformers were rated to withstand 20,000 volts, 60 cycles, for one minute between the primary and secondary windings. They have an operating efficiency under normal conditions of 92 per cent with a power factor of 98 per cent.



FIGS. 6A AND 6B—TYPE OF DUCT CONSTRUCTION

Fig. 6A—Manholes and handholes used in this street-lighting system, showing the accessibility of transformers.
Fig. 6B—Sections of the various duct lines ranging from one to eighteen.

With a transformer in the base of the lamp post or on a pole, the secondary wires can be carried to the lamp, and it is perfectly safe to make a lamp change without shutting off the current, as there is a heavy insulating barrier between the primary and secondary windings. When a lamp goes out the open-circuit voltage of the transformer will only rise from two and one-half to three times the normal lamp voltage, which is a negligible quantity. The transformers automatically adjust themselves to the resistance of the lamp, which varies slightly. A lamp rated at 15 amp. and 15 volts

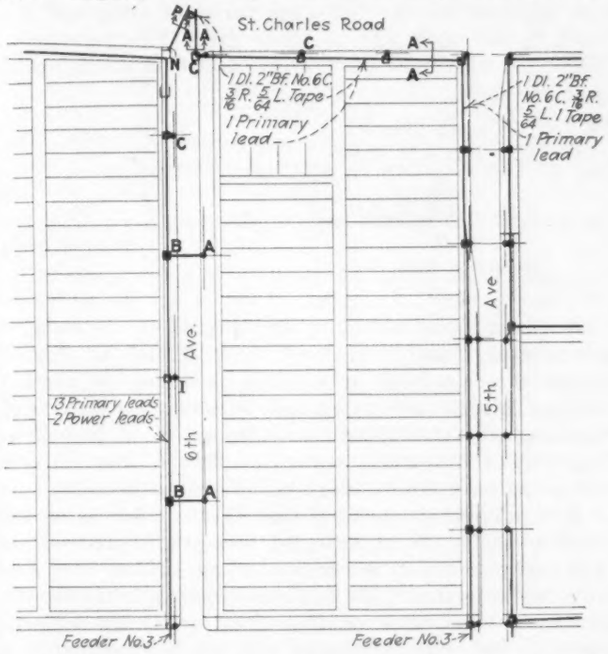


FIG. 7—FEATURES OF THE CABLE DUCT, INDICATING THE SIZE OF BOTH MANHOLES AND DUCTS

may require anywhere from 13.5 volts to 17 volts to bring the current up to normal in the lamp. The transformer ratio at normal load will be correct within 1 per cent, while the regulation of the lamp current will be within 0.5 per cent with a variation of lamp resistance from 80 per cent normal to 110 per cent normal value. Should primary current rise to 150 per cent, the secondary current will not increase to more than 154 per cent.

The temperature rise will not exceed 35 deg. C. under load nor 55 deg. C. at open circuit above the temperature of the surrounding atmosphere. When a constant-potential transformer is used as a source of supply, the Kuhlman series multiple will automatically maintain normal current flow in the circuit, independent of lamp outages, up to a point where 25 per cent of the lamps are out. As lamps go out the correct amount of reactance is added to the resistance to accomplish this. If more than 25 per cent of all the lamps should be accidentally put out, then the currents would drop to a point where the illumination would be reduced, but no harm would come to any lamp remaining in circuit.

The total cost of the street-lighting installation is given in the table as $481,131.66. Although no engineering illumination tests were conducted upon its completion, observation of its lighting effectiveness has indicated that the citizens of Maywood have reason to be well pleased with the results obtained. Appreciation should be expressed for the assistance rendered to the author in the preparation of this article by H. A. Johnson of the Kelley Construction Company.

Short-Circuit Calculations

A Simple Method for Determining Currents Where Calculating Board Is Not Available—Practical Application of Formulas

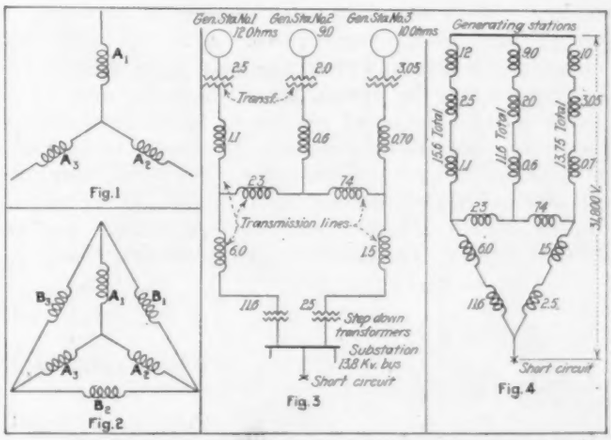
BY R. RADER
Assistant Engineer Puget Sound Power & Light Company, Seattle, Wash.

THE determination of the size and type of oil circuit breakers and the setting of relays on a system to keep disturbance to a minimum and at the same time provide adequate protection for equipment are problems of considerable magnitude which are continually confronting the operating engineer. A knowledge of short-circuit conditions is absolutely essential, and the solution of these problems involves a study of short-circuit currents at several points on the system. Although the principle involved as presented in this article is not new, it is thought that it will be of considerable value to operating companies where generating capacities are increasing at a rapid rate, giving rise to short-circuit currents in the system of ever-increasing magnitude.

When the system constitutes a fairly complicated network of impedances, the operating engineer is confronted with an apparently complex problem. If he is somewhat rusty in mathematics, he is tempted to estimate the results or else pass the problem on to the designing engineers of the company from which the equipment was purchased. This involves considerable delay and oftentimes unnecessary expense.

A few of the larger operating companies have installed calculating boards on which the constants of the generating and transmission systems are reproduced in miniature. When a low voltage is impressed on such a network, a short circuit can be imposed at any desired point on the miniature system. When multiplied by the proper reduction factor, the value of the instantaneous short-circuit current on the actual system can be obtained with a sufficient degree of accuracy.

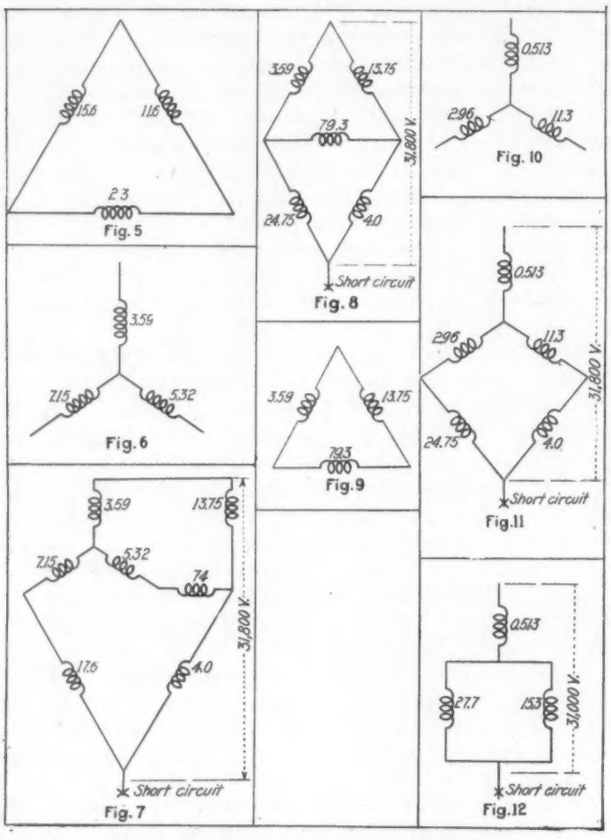
When a large number of calculations are to be made, a calculating board is a very valuable piece of equipment and will pay for itself in a short time in the saving of labor. If, however, a calculating board is not available, the instantaneous short-circuit current on any part of the system can be readily obtained by the application of the formulas of equivalent star and delta impedance, by which a delta circuit may be changed to an equivalent star, and vice versa. These formulas were originally



FIGS. 1 TO 4—STEPS IN SIMPLIFICATION OF CALCULATIONS

developed by A. E. Kennelly and published in an article on "The Equivalence of Triangles and Three-Pointed Stars in Conducting Networks" in the ELECTRICAL WORLD for September 16, 1899 (Vol. 34), page 413.

It is generally best to reduce all impedances of the network under consideration to single-phase values in terms of either the transmission-line voltage of line to neutral or of the voltage to neutral at the point of short circuit. The impedances may be added as complex quantities, but it is generally permissible to add



FIGS. 5 TO 12—EQUIVALENT CIRCUITS USED IN SOLUTIONS

them arithmetically. Since the impedances are largely made up of reactances, the error in so doing is very small and on the safe side. For generators and transformers reactances may be used instead of impedances in the network. The error introduced by using the arithmetical method of addition instead of the vector method will be found in most systems to be within 5 per cent and generally much less. After the impedance values are determined from the basic data, the simplified circuit may be drawn, after which the number of points of intersection of reactances in the network can easily be successively reduced by substituting equivalent values of star or delta impedances as the case may call for. The purpose of this scheme is to obtain impedances in straight series so that they can be directly added. The formulas are given as follows:

Delta to Star	Star to Delta
$A_1 = \frac{B_1 B_2}{B_1 + B_2 + B_3}$	$B_1 = \frac{A_1A_2 + A_1A_3 + A_2A_3}{A_2}$
$A_2 = \frac{B_1 B_2}{B_1 + B_2 + B_3}$	$B_2 = \frac{A_1A_2 + A_1A_3 + A_2A_3}{A_1}$
$A_3 = \frac{B_2 B_3}{B_1 + B_2 + B_3}$	$B_3 = \frac{A_1A_2 + A_1A_3 + A_2A_3}{A_3}$

Example.—To change the star impedances shown in Fig. 1 to an equivalent delta, solve for B_1, B_2 and B_3 and then place this delta in the network in the same position as previously occupied by the star, keeping the points corresponding as shown in Fig. 2. In changing from delta to star, solve for A_1, A_2 and A_3 and replace the delta values with the calculated star values.

Some engineers prefer to work with admittances instead of impedances, although there is no advantage in so doing except perhaps when the vector quantities are used in the calculations. In case it is desired to use admittances, the following formulas apply and are used in the same way as those given for impedances. Fig. 2 is also here used to represent the admittance star and delta.

Delta to Star	Star to Delta
$A_1 = \frac{B_1B_2 + B_1B_3 + B_2B_3}{B_2}$	$B_1 = \frac{A_1A_2}{A_1 + A_2 + A_3}$
$A_2 = \frac{B_1B_2 + B_1B_3 + B_2B_3}{B_3}$	$B_2 = \frac{A_2A_3}{A_1 + A_2 + A_3}$
$A_3 = \frac{B_1B_2 + B_1B_3 + B_2B_3}{B_1}$	$B_3 = \frac{A_1A_3}{A_1 + A_2 + A_3}$

An example of applying the impedance formula to a particular case is given in Figs. 3 and 4. Fig. 3 shows three generating stations operating in parallel feeding into a substation bus through a network of transformers and transmission lines. It is desired to know the short-circuit current with the short circuit occurring on a feeder line near the substation bus.

It is, of course, essential that the impedances of the system, which are at different voltages, be reduced to equivalent values at a common voltage before they can be added together. In this case assume transmission at 55,000 volts between line wires, or 31,800 volts to neutral, and the impedance will all be expressed in terms of this voltage.

Assume that generating station No. 1 has a rated capacity of 45,000 kva. and the generated voltage is 6,600 volts, or 3,810 volts to neutral, and the impedance of the generators is 17.8 per cent.

Combined full load current = 3,940 amp.

Impedance volts per phase = $3{,}810 \times 0.178 = 680$

Impedance = $680 \div 3{,}940$

= 0.173 ohm at generator voltage

In terms of 55,000 volts (31,800 to neutral) the impedance is $0.173 \times (55 \div 6.6)^2 = 12$ ohms (Fig. 3).

In like manner the impedances are obtained for all the generating stations and transformers, including the step-down transformers at the receiving station.

Fig. 4 shows a simplified diagram of the same system as in Fig. 3 in which the generating stations are shown as electrically tied together. This is permissible since they are operating in parallel.

Now, replacing in Fig. 4 the delta (Fig. 5) with the equivalent star (Fig. 6), the network Fig. 7 is obtained, which by adding series impedances reduces to Fig. 8. Replacing in Fig. 8 the delta (Fig. 9) with the equivalent star (Fig. 10), the circuit becomes Fig. 11, which reduces to Fig. 12. The solution of Fig. 12 gives a single impedance of 10.36 ohms in terms of the 55,000-volt system (31,800 volts to neutral).

The impedance in terms of 13,800 volts (7,960 volts to neutral) = $(13.8 \div 55)^2 \times 10.36 = 0.652$ ohm.

The instantaneous three-phase short-circuit current at the 13,800-volt bus = $13{,}800 \div (1.73 \times 0.652) =$ 12,250 amp.

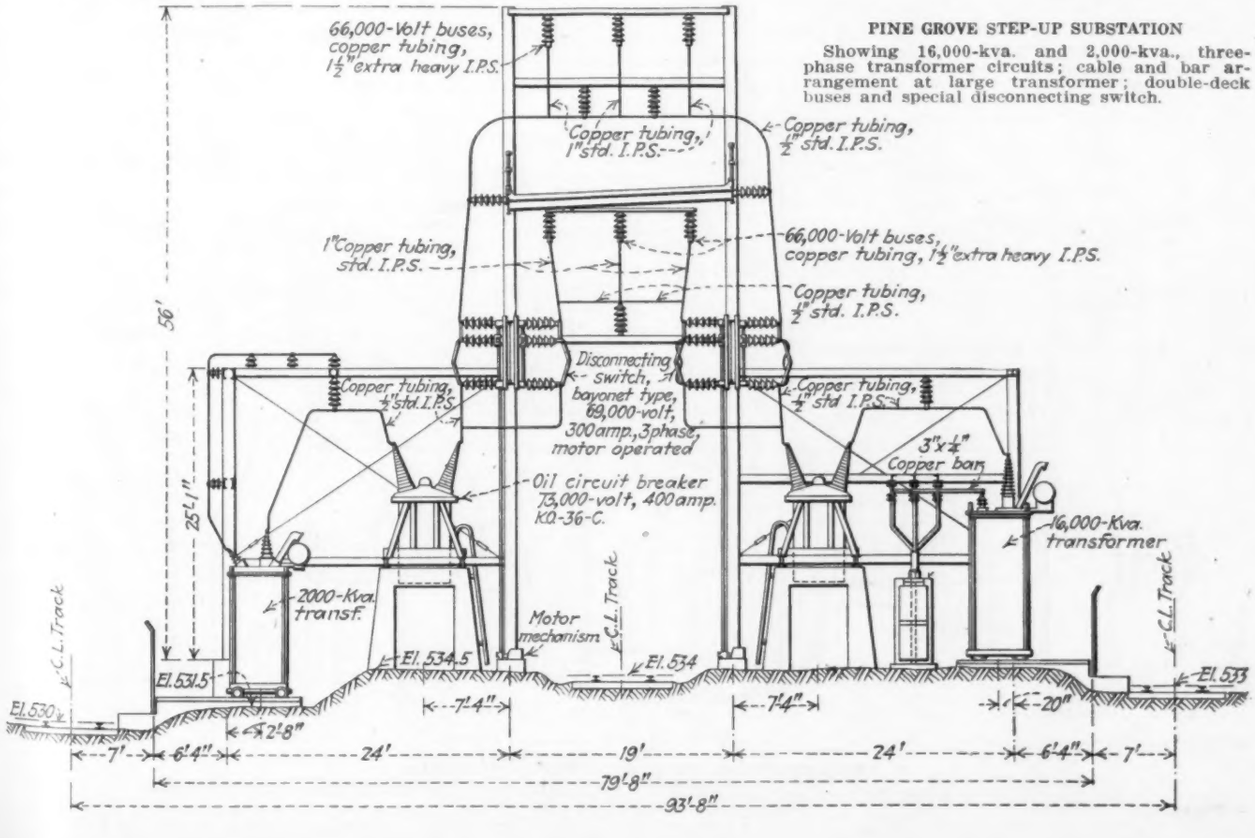
New Types of Outdoor Substations—II

Specific Installation Details for Modern Step-Up and Step-Down Outdoor Substations—Securing Safety and Economy Without Decreasing Reliability

By C. D. GRAY and M. M. SAMUELS
The J. G. White Engineering Corporation

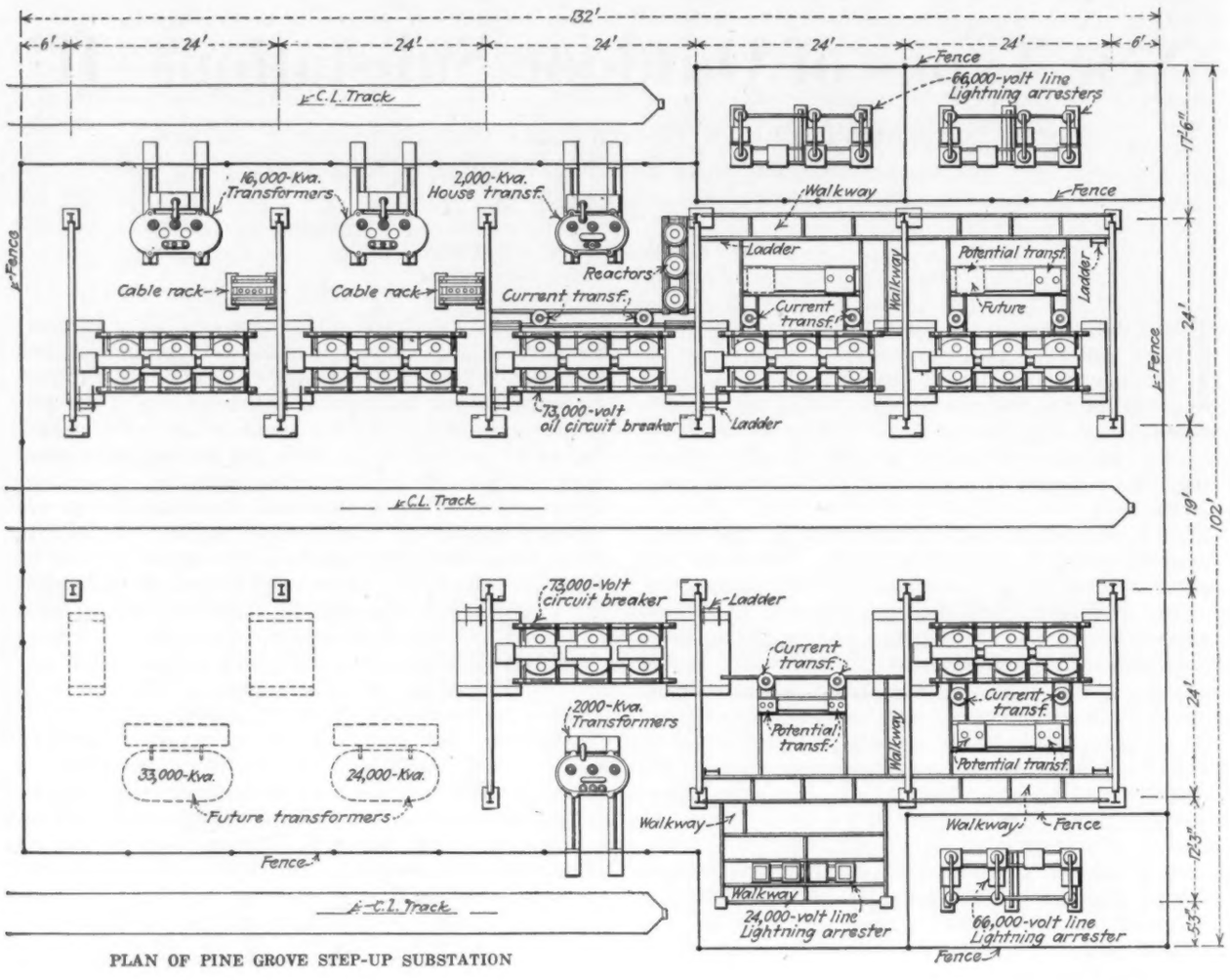
IN THE ELECTRICAL WORLD of August 2, 1924, page 208, the general principles underlying the design and operation of outdoor substations were given and the following description of the two substations, one at Pine Grove, Pa., and the other at Pottsville, Pa., serves to illustrate the application of these principles to specific and typical step-up and step-down transformers.

The features of the step-up substation at Pine Grove consist primarily of the transformers. There are two main transformers, each being 16,000-kva., three-phase, 60-cycle, 69,000-66,000-63,000-volt high and 12,000-volt low, the low-tension side being connected to three three-conductor, 550,000-circ.mil cables leading to the generator in the power house. Each three-conductor cable has three single-conductor potheads, making a total of nine potheads per transformer, connected in three sets of three each by means of copper bars to the transformer terminals. By making this transformer delta-connected on the high side and Y-connected on the low side, it was possible to accommodate this three-phase, 16,000-kva. unit in a tank so small that it could be shipped on a car with its oil, thus establishing a rather remarkable record in transformer design. Besides the main units, there is one 2,000-kva., three-phase unit to supply a local 24,000-volt circuit and one 2,000-kva., three-phase unit to supply 2,300-volt auxiliaries and equipped on its 2,300-volt side with a set of external outdoor reactors, making the total reactance of the unit 20 per cent. All of the transformers are water-cooled, the water being supplied from the large-spray cooling pond which exists in connection with the circulating-water system of the condensers. Railroad sidings are provided so that the transformers can be brought into the power-house building, where they can be handled by means of the crane. There are two sets of 66,000-volt buses, which are arranged in a manner rather novel in outdoor substation design, one above the other with a concrete slab between. This scheme makes the station very compact, and the concrete slab not only protects one set of buses from any possible short circuit on the other set, but furthermore allows a force of men to work safely on one bus when the other is energized. Each circuit has two motor-operated disconnecting switches, corresponding to the two sets of buses, and one oil circuit breaker. The two sets of disconnecting switches are electrically interlocked so that only one can be closed at one time and are further interlocked with the synchronizing system so that it is impossible to throw the circuit on the bus whose

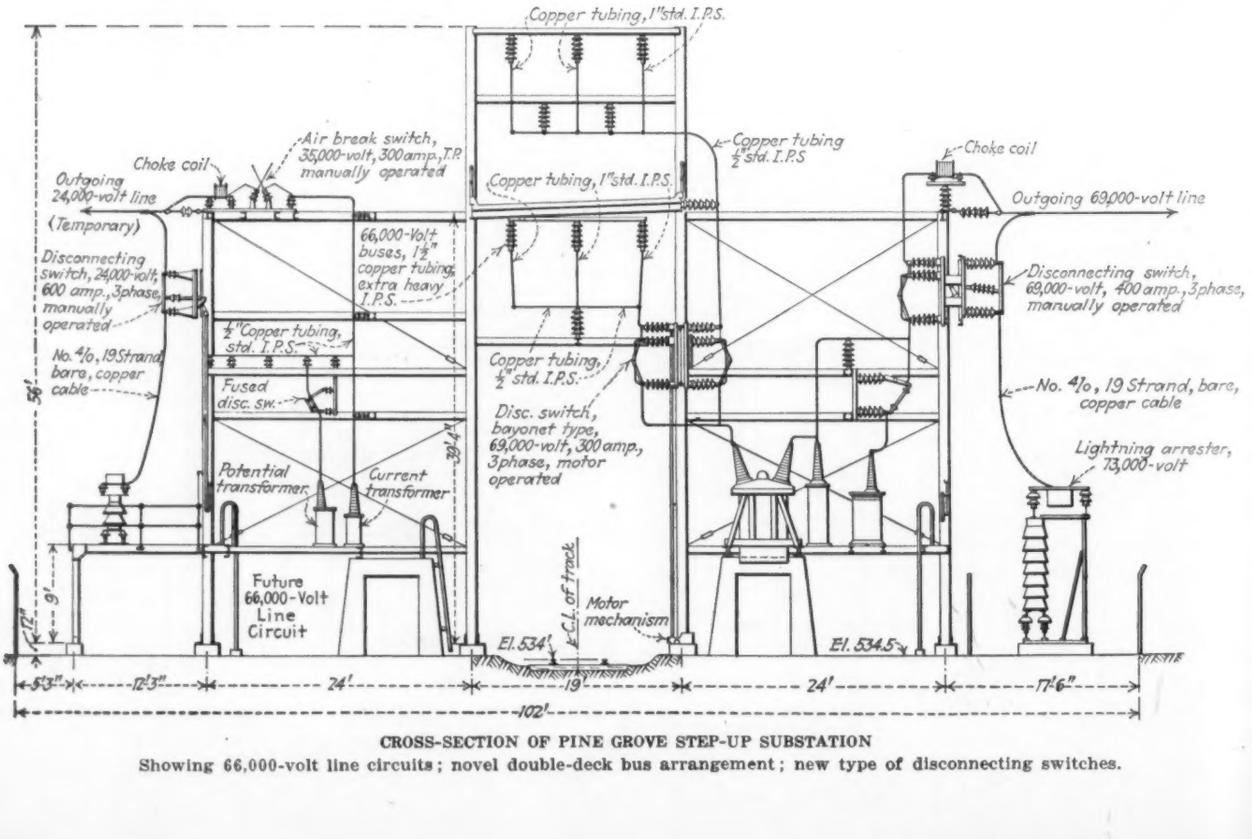


PINE GROVE STEP-UP SUBSTATION

Showing 16,000-kva. and 2,000-kva., three-phase transformer circuits; cable and bar arrangement at large transformer; double-deck buses and special disconnecting switch.



PLAN OF PINE GROVE STEP-UP SUBSTATION



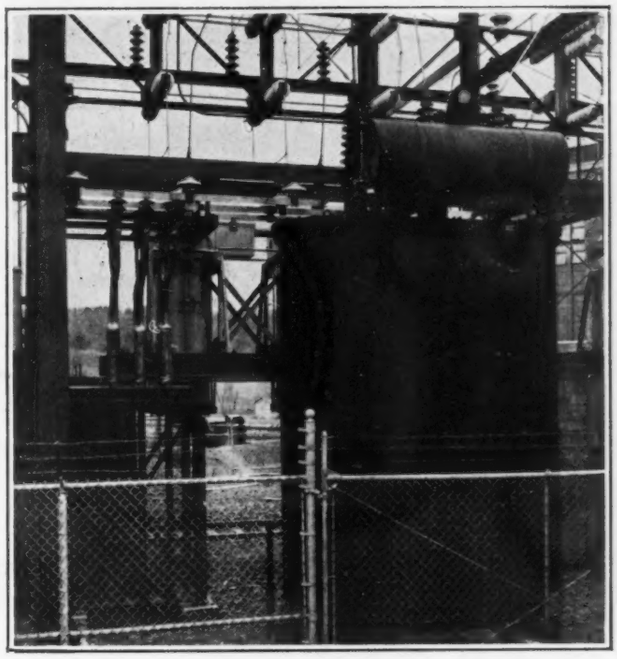
CROSS-SECTION OF PINE GROVE STEP-UP SUBSTATION

Showing 66,000-volt line circuits; novel double-deck bus arrangement; new type of disconnecting switches.

disconnecting switch is closed unless synchronism has been established with this bus. It is intended to provide in the future a bus-tie oil circuit breaker, the control of which will be interlocked with the synchronizing system, and which, when closed, will cut out the interlocks between the two sets of disconnecting switches, so that when synchronism is established between the two buses it will be possible to close both sets of disconnecting switches of a circuit at one time and thus transfer the circuit from one bus to the other without opening the oil circuit breaker.

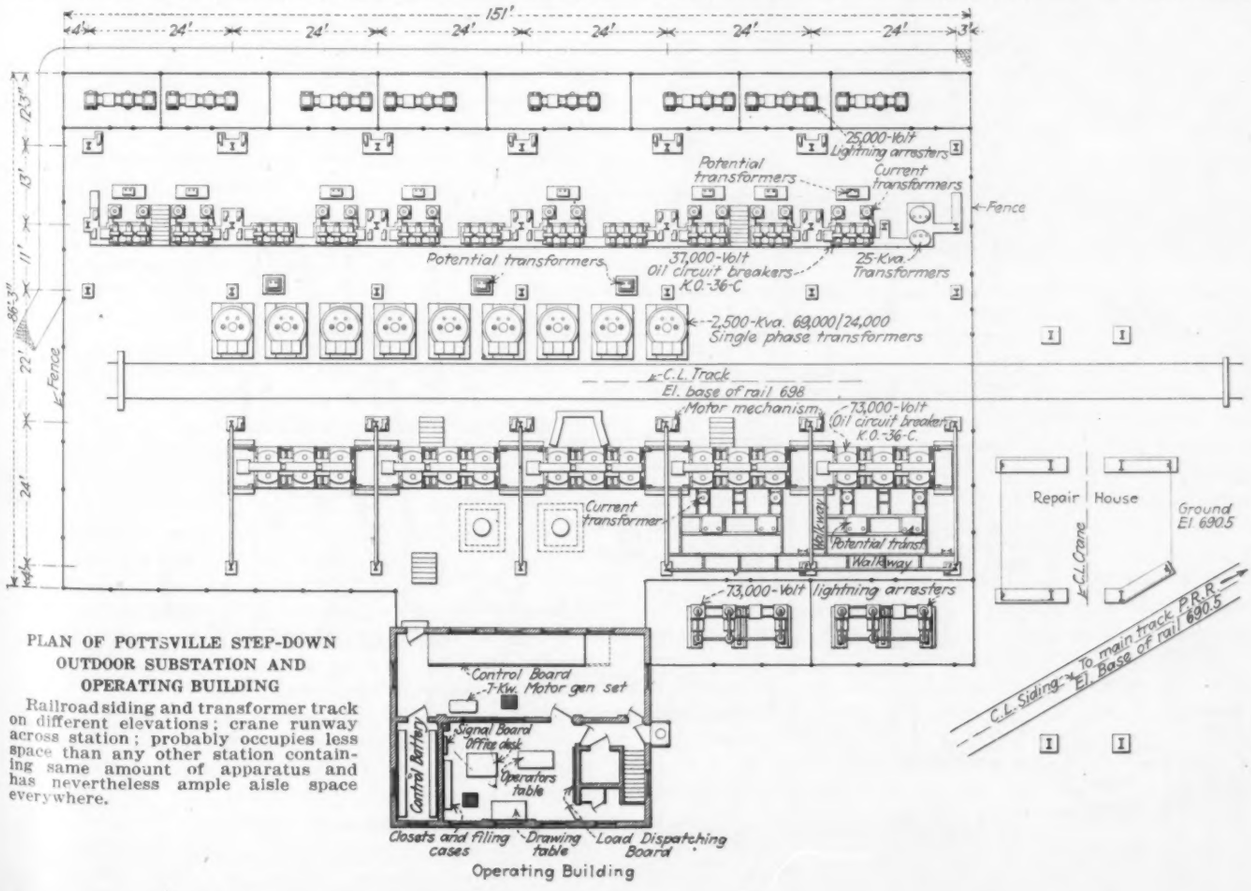
The 66,000-volt oil circuit breakers in both stations are General Electric type K-O-136-C and have sufficient rupturing capacity to take care of any short circuit which may occur in the future after the station has gone to its ultimate capacity. These oil circuit breakers are placed on a foundation of considerable height to allow the tanks to be lowered, and the interiors of several common foundations between two breakers are utilized for telephone houses, junction boxes, lighting cabinets, etc. The current and potential transformers are placed on a level with the top of the oil-circuit-breaker foundations, and a walkway consisting of gratings and hand rails is provided on this level all around the apparatus. This station, which occupies a fenced-in area of 102 ft. x 132 ft., has room within the fence line for two additional main transformers, one additional house transformer and three future 66,000-volt lines in addition to the three present lines, two of which go to Pottsville and one to Lebanon.

The features of the step-down substation at Pottsville are as follows: There are three banks of transformers, each bank consisting of three 2,500-kva. single-phase, self-cooled units, 69,000-66,000-63,000 high voltage, 24,000 low voltage, all nine transformers



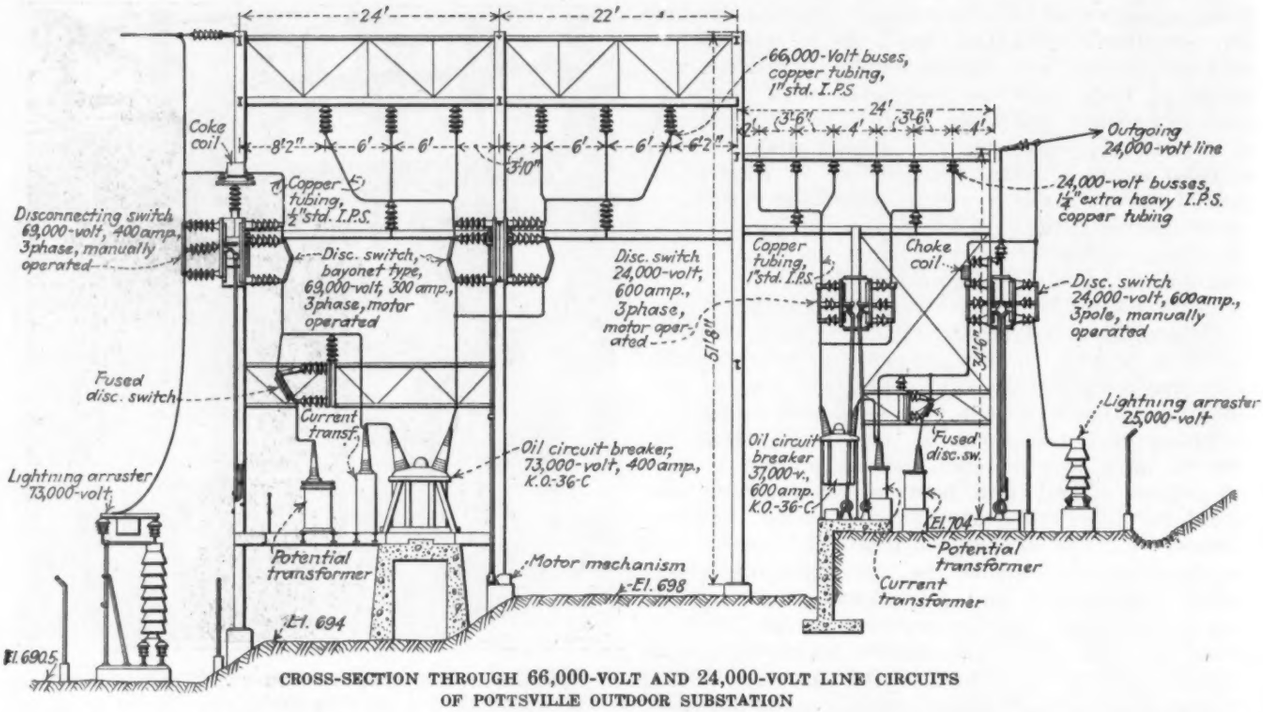
16,000-KVA., THREE-PHASE WATER COOLED TRANSFORMER AT PINE GROVE

arranged in one row, parallel to which runs a transfer track. Owing to the fact that this station had to be built in a hillside, the leveling of which would have called for an enormous expenditure, the apparatus was arranged on four different elevations, having a difference of approximately 15 ft. from the lowest to the highest level. On the lowest level are the operating



PLAN OF POTTSVILLE STEP-DOWN OUTDOOR SUBSTATION AND OPERATING BUILDING

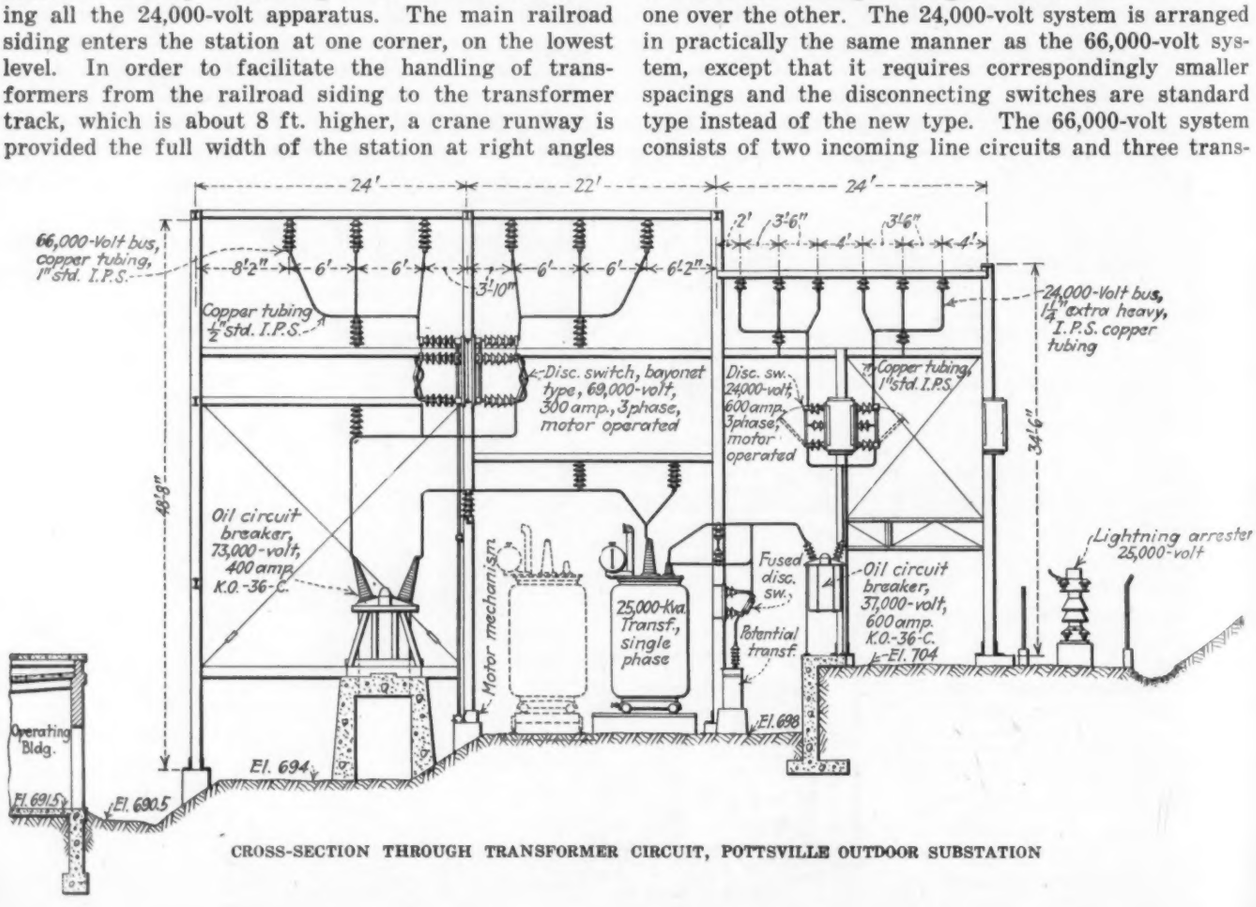
Railroad siding and transformer track on different elevations; crane runway across station; probably occupies less space than any other station containing same amount of apparatus and has nevertheless ample aisle space everywhere.



CROSS-SECTION THROUGH 66,000-VOLT AND 24,000-VOLT LINE CIRCUITS OF POTTSVILLE OUTDOOR SUBSTATION

building, which likewise serves as load dispatcher's headquarters, and the 66,000-volt lightning arresters. On a level about five feet higher are the foundations for the 66,000-volt oil circuit breaker; four feet above this is the main transformer aisle with its track, and finally six feet above the transformer floor and separated from it by a retaining wall is the level containing all the 24,000-volt apparatus. The main railroad siding enters the station at one corner, on the lowest level. In order to facilitate the handling of transformers from the railroad siding to the transformer track, which is about 8 ft. higher, a crane runway is provided the full width of the station at right angles to the transformer track. The crane can likewise be used for handling oil circuit breakers and other equipment. The middle portion of the crane runway is inclosed and forms a repair house.

The 66,000-volt buses and switches are similar to the Pine Grove arrangement except that the two sets of buses are arranged alongside each other instead of one over the other. The 24,000-volt system is arranged in practically the same manner as the 66,000-volt system, except that it requires correspondingly smaller spacings and the disconnecting switches are standard type instead of the new type. The 66,000-volt system consists of two incoming line circuits and three trans-



CROSS-SECTION THROUGH TRANSFORMER CIRCUIT, POTTSVILLE OUTDOOR SUBSTATION

former circuits, while the 24,000-volt system consists of three transformer circuits and eight line circuits. Balanced protection is provided for the 66,000-volt lines as well as for three pairs of 24,000-volt lines.

The switchboard lighting is taken care of by means of continuous Frink diffusers, the office lighting by Holophane units, and the outdoor lighting by Benjamin steel reflectors of various types and sizes according to their locations. The operating building contains the telephone switchboard for the whole East Penn system, but separate telephone communication is provided between the switchboard and the outdoor substation.

All transformers, oil circuit breakers, lightning arresters and switchboard were supplied by the General Electric Company, disconnecting switches and choke coils by the Electric Power Equipment Company, high-tension fuses by Schweitzer & Conrad, Inc., bus supports by the Jeffery-Dewitt Insulator Company, high-tension cable and potheads by the Standard Underground Cable Company, control cable by the Simplex Wire & Cable Company, switchboard lighting by I. P. Frink, Inc., other fixtures by the Benjamin Electric Manufacturing Company and Holophane Glass Company, signboards and signal boxes by Charles Cory & Sons, and condulets and lighting cabinets by Crouse-Hinds Company. The two substations were designed and constructed by the J. G. White Engineering Corporation.

Use of Purchased Power in Hotels

To Eliminate All Possible Wastage Central-Station Engineers Should See that Proper Electrical and Steam Equipment Is Installed and Later Check Up on Efficiency of Operation—Correction of Wasteful Practices

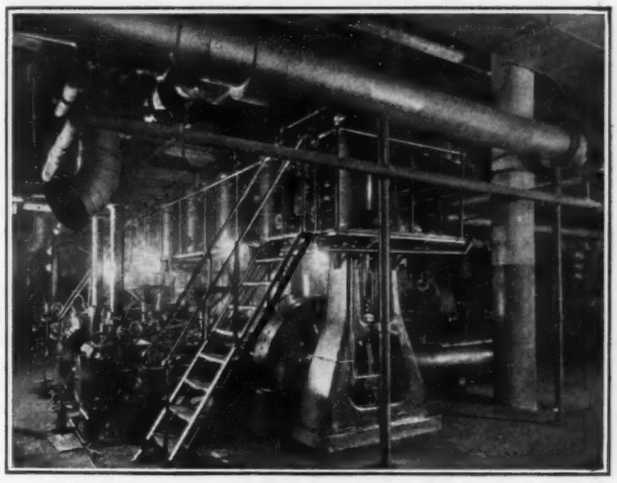
By W. H. WHITTON
The New York Edison Company

HOTELS as a class have been one of the most difficult for the central-station selling organizations to obtain as power customers; but, like most difficult subjects, the hotel as a private plant operator has its weak as well as its strong points, and of recent years careful study of both by central-station commercial engineers has led to a much more optimistic view of the economic advantages of purchased electricity than formerly prevailed.

There is probably no part of the modern hotel equipment and organization with which the average hotel manager is less well acquainted than the engine room. Unversed in the technicalities of electrical and mechanical problems, he does not as a rule have the necessary foundation of knowledge on which to base his judgment —however sound it may ordinarily be—when consideration is given to the various factors that enter into the question of whether to use central-station service or to operate a local plant. It is all the more important, therefore, that the central-station salesman should be thoroughly informed on such matters.

Hotel characteristics are in general more favorable for the economical operation of private plants than are those of most types of buildings. As a class, they have unusually high load factors, due partly to the normal requirements of twenty-four-hour activity, partly to the justifiably lavish use of light in the public portions of the buildings, and partly to the impossibility of controlling the use of light in the guest rooms, where great waste occurs. This favorable load factor not only permits the operation of generating units at comparatively uniform and favorable points of loading, but it spreads the "overhead" over so large an output of electrical energy as to reduce the overhead charges per kilowatt-hour to a relatively low figure; and unless its electric rate schedules are designed to meet this condition, the central station finds itself at a serious disadvantage.

A handicap that is always present is the fact that the generation of electricity in a hotel is so intertwined with other services, such as the production of steam for



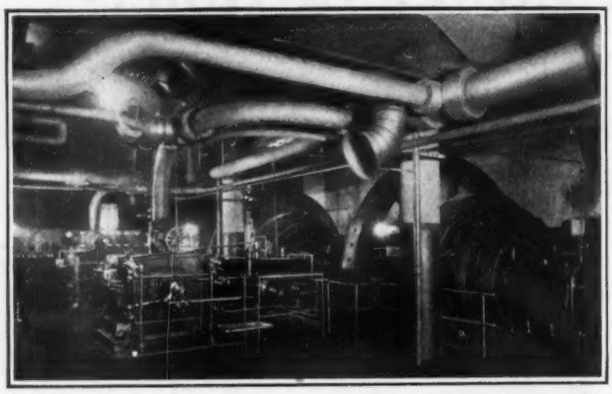
STEAM REFRIGERATING MACHINERY ABANDONED IN FAVOR OF ELECTRICALLY OPERATED EQUIPMENT

building heating, hot water, cooking, laundry, and very commonly a large assortment of piston apparatus, the care of extensive plumbing and heating systems, etc., that the operation of the electric generating units can be regarded as only one of a number of closely related activities of the engineering department, the elimination of a portion of which will often have but little effect in modifying the more important items of operating expense. The problem, then, is so to plan a reorganization of these activities that the abandonment of the generating units will be reflected to the largest possible extent on the expense sheet. This means the elimination of all possible wastage and the use of equipment, both electrical and steam, adapted for economical operation in combination with purchased electricity.

It is in new hotels, of course, where the omission of generating plants permits the elimination of large investments—thus saving the fixed charges of interest and depreciation—that the largest savings can be shown.

The adoption of central-station service in such circumstances is accordingly more readily accomplished than in the case of existing hotels, where the investments have already been made and the central-station rates must compete with the operating expenses directly chargeable to the production of electricity.

In most of the present-day hotels where generating plants are in operation the attendant machinery, as previously indicated, is steam-operated. This includes house-water pumps, sump pumps, boiler-feed pumps, refrigerating apparatus, elevator pumps, air compressors and other apparatus. In addition, steam is used for cooking, for laundry purposes, for building heating and for hot water. Now, it is a fact, although one that is often lost sight of, that of the entire equipment of a plant of this kind the generating units are by far the most efficient, and that the great wastages of steam occur in connection with the accompanying apparatus



GENERATING UNITS SUPERSEDED BY CENTRAL-STATION SERVICE

and the complicated systems of piping and traps that this machinery makes necessary. Considering this and the simplification of the attendance and other problems of the engineering department that the change makes possible, it has appeared advisable, if the generating units are abandoned, to substitute electrically operated machines for all of the steam apparatus and to block off or remove the piping that is no longer required, placing the steam system on a low-pressure basis.

Where the steam requirements will not permit the operation of the boilers at low pressure, a pressure of about 40 lb. will usually be found satisfactory—this pressure sometimes being necessary where the kitchen equipment cannot without extensive replacement be adapted either for lower steam pressures or for operation by gas. Perhaps the laundry mangle is the only piece of hotel apparatus for which high-pressure steam still remains an actual necessity. The smaller sizes can be successfully heated by gas, but in the larger sizes steam at not less than 70 lb. pressure is required. In the smaller hotels it is often found economical to have the laundry work done outside—especially if space is a consideration. One centrally located hotel in New York is about to remove its laundry and utilize the space thus freed for a cabaret. In the larger hotels, where the quantity of laundry work may be too great to have it done outside at a competitive figure, high-pressure steam for the mangle can be furnished from an independent boiler fired either by coal or gas. The latter is much the more convenient and will in many instances be found the cheaper.

Low-pressure steam will furnish all the heat that is required for cooking purposes if the cooking utensils are designed with the proper heating surface and with pipe connections of the proper size. Of course, the lower the temperature at which steam is used, the greater the quantity required. Pipe connections and heating surfaces must therefore have a capacity adapted to the temperature of the supply.

From this brief review of the considerations that are involved in securing the adoption of central-station service in hotel buildings the degree of care that must be exercised in canvassing for the business will be apparent. In the company with which the writer is connected the procedure usually employed in the sales program of plant abandonment includes the preparation of reports and estimates on the comparative cost of central-station and private-plant service, the preparation of specifications covering the changes of equipment on which the operating economies are predicated, and finally, after the business has been obtained, a careful follow-up of tests and observations to make sure that with the new equipment and methods the proper economies are being effected.

In the reports of comparative operating costs, which may cover from six to twelve typewritten pages, each item of expense is briefly analyzed, values being determined from record, test or comparison with other known installations. Included in these reports are outlines of the changes in equipment and methods that the commercial engineers have determined to be the most advantageous.

HOLDING THE BUSINESS AFTER IT IS TAKEN ON

The necessity of paying great attention to the preliminary canvassing effort in operations of this kind will be readily recognized, but it is perhaps not so generally realized that after the business has been obtained even closer attention is sometimes required to hold it—that is, to hold it on the clean-cut basis of satisfaction to the customer. The substitution of central-station service for private-plant operation, the replacement of electric for steam machinery, and the other modifications referred to, create an entirely new set of conditions, and unless those in charge are prepared completely to modify the previous operating methods to meet those new conditions, it is hopeless to expect that fully satisfactory results will be obtained. There is always the possibility, also, that in installing the new equipment the specifications may have been departed from, either with or without the knowledge of the hotel management, and serious interference with the proper conduct of affairs may result. For instance, in one case the failure to replace the steam supply pipe to the kitchen by one of greater capacity made it necessary, until the matter had been remedied, to continue the operation of the boilers at high pressure. Had the central-station representative not been in touch with the situation, it is safe to believe that the proprietors would have been far from satisfied with the general results attending the adoption of street service.

Appreciating the importance of the follow-through, a system has been adopted of checking up on every detail of the revamped installations, including tests of the new equipment, both as to individual efficiency and over-all economy, observations of the boiler-room methods, studies of the lighting systems, etc.

Very excellent results have followed from this method of supervision. In one large hotel having four hydraulic elevators, for the operation of which electric pumps were substituted for the steam ones, it was

found as a result of the first week's observation that energy was being used at the rate of slightly more than 13 kw.-hr per car-mile of elevator travel. This was materially more than had been estimated and attention was accordingly centered on the elevator problem. It was observed that two of the three elevator pumps, which are automatically controlled units of 75 hp. each, threw in and out of service with great frequency. Adjustments were made to the control system, and after a little study it was found possible to operate in such a manner that one of the pumps ran almost continuously with a second one coming in only at such times as the pressure, owing to the peaks in the elevator service, tended to drop. The third pump simply acted as an extra or reserve. With a few other minor changes that were made, the consumption of energy dropped to an average of 10.2 kw.-hr. per car-mile, representing a saving to the hotel of well over $2,500 annually.

SMALL LEAKS BULK LARGE

In another hotel of about the same size where, in connection with the abandonment of the generating plant, the refrigerating equipment, house pumps, sump pumps and boiler-feed pumps were electrified, the use of current by the refrigerating machine seemed abnormally high. On examination a number of faults were found, no one of them very serious, but in the aggregate of considerable importance. The feed and return brine lines ran for some distance side by side with insulation covering both with no insulation between them. Thus the feed line was continually absorbing heat from the return line. These pipes were reinsulated. The oil and scale separator had been left in its original location near the old steam compressor, which was, however, about 70 ft. away from the location of the new refrigerating machine. This necessitated an unnecessary run in the ammonia lines of about 70 ft. each way.

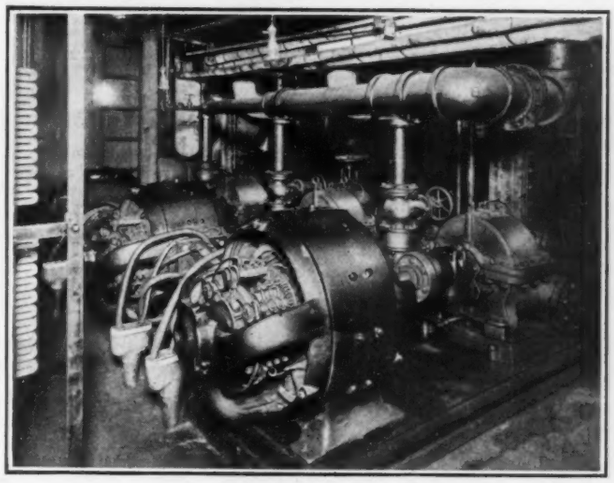
A more favorable position for the separator was found, and at comparatively small cost it was moved nearer the refrigerating compressor. Much more ice was being made than was required, and about half the cans were withdrawn from the tank. An improvement in the operating conditions was also effected by increasing the head pressure of the compressor, thus permitting the operation of the apparatus for shorter periods. Altogether, the energy consumption was materially reduced.

In a recent instance the consumption of energy for pumping the house water appeared to be abnormally high. Preliminary estimates had placed this requirement at 10,000 kw.-hr. yearly, but it developed after the installation of the electric pump that it was consuming energy at the rate of about 30,000 kw.-hr. yearly. The use of a roof tank for house water supply had been assumed, but it appeared that this tank, requiring repairs, was no longer used. The matter was, of course, called to the attention of the proprietor, and when he realized that a saving in his energy bills of several hundred dollars yearly could so easily be effected, the tank repairs were quickly made. Incidentally, had his steam pumps remained in service this constant wastage would have remained unchecked.

In this same hotel a circulating pump was used for the condenser of the ice machine. The discontinuance of this pump was recommended, as the street pressure was quite sufficient for the purpose. Other adjustments to the ice machine were also suggested and carried out with worth-while reductions in the use of energy.

Boiler-room methods can very often be improved. A stupid or careless fireman, if left to his own devices, can waste enough fuel to cut very deeply into the savings that should accompany the changed methods of operation. Practical suggestions and supervision can largely remedy such faults, and once proper methods have been adopted and persisted in for a time, the improvement is apt to be a permanent one. In connection with this, careful study of the methods used in heating water and of the laundry and cooking equipment may indicate places where improvements can be effected relating both to the consumption of fuel and to the degree of the customer's satisfaction with the performance of the apparatus.

The grade of fuel burned is also a matter that can profitably be made the subject of study. Large savings have in some instances been made by prescribing the quality that can be most effectively used under the conditions prevailing. The use of forced draft in connection with low-grade fuels can only be determined by a study of the individual equipment and conditions. A collateral consideration, of course, is the possible use of fuel oil instead of coal. This is another of those problems which can be safely passed upon only with a clear knowledge of all the attending circumstances, including the local regulations controlling the use of fuel oil, the relative prices of coal and oil, the facilities for storage, etc.



ELECTRIC ELEVATOR PUMPS

Adjustments of the control and equipment reduced the bills $2,500 yearly.

Efficiency studies of lighting installations often are effective means of cutting down expenses. Detailed surveys of the entire lighting equipment are made, and after sufficient study recommendations are prepared for any changes that may bring about improvements either in the illumination or in the economy of operation. Methods of controlling the use of light are also studied, inspectors being detailed for duty throughout the twenty-four hours of the day, sometimes for extensive periods, to exercise supervision over the lighting installations.

In carrying out this work the hotel employees are, almost without their realizing it, trained to turn off lights that are being used unnecessarily and in other ways to effect economies. In the guest rooms, naturally, very little control can be exercised over the use of light, but even in this respect it has been found that some improvement has been possible through the post-

ing of courteously worded requests to turn off the lights on leaving the rooms. Through these various means remarkable economies in the use of energy have in some cases been made.

COMPANY'S DUTY TO RENDER ENGINEERING SERVICE

The question has sometimes been asked by Edison customers in whose premises the efficiency methods described have been applied why the company should go to such expense and take such pains in an effort the immediate result of which is a reduction in its income. The answer is, of course, so obvious to those interested in central-station matters as hardly to need repetition. It is manifestly the company's obligation to render a service that makes it possible for the customer to utilize its product to the very best advantage, and certainly it is very much to the company's benefit to supply its product under such circumstances.

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Engineering Assistance to Inventors

To the Editors of the ELECTRICAL WORLD:

The life in this country is highly stimulating for the inventive activity. In our work and in our recreation we are surrounded with more or less ingenious patented devices, which naturally turn our minds to work on similar devices and inventions.

A great deal of such inventive thought, however, is largely misdirected, leading to the waste of time and money, especially when the inventor, through lack of proper technical training, is not in a position to analyze his invention critically and to judge of its value.

This is especially true in regard to electrical inventions. A large proportion of such inventions do not bring any money to the inventors, often because the invention has not been worked out properly in the light of engineering knowledge, or it may be faulty even in its conception, or the inventor's solution of the problem may not be wanted in the electrical industry.

In such cases the inventor should discuss his invention with an experienced electrical engineer before filing a patent application. Unfortunately, however, the inventors are very reluctant to show their inventions to specialists for fear that they may steal their ideas. Such fear, of course, is just as groundless as it is ridiculous. The inventor can always have his drawings and statements dated and witnessed in order to alleviate his fear. And whoever heard of engineers so betraying the confidence of inventors? Even common sense should tell them that the engineer's standing in his profession is much too valuable to be jeopardized by such larceny.

It is the engineer's duty to meet the inventor half way and to explain to him the fallacy of such fears. The invention should be then examined and technical or scientific errors pointed out. The invention may be worthless, in which case the inventor should be advised against spending money on it. Or it may be corrected and the faulty features changed or eliminated, which sometimes may mean all the difference between worthless and valuable inventions.

It may be also that the invention is technically correct, but there could not be any possible demand for it. Then the inventor should know that a patent on such an invention would be simply a long-shot gamble.

Often the inventor is poor and cannot pay the engineer for his services. But the engineer must remember that his superior knowledge and training place him under certain obligations before society, and by helping the inventive minds to develop new ideas he may render invaluable services to the engineering science and to the people at large.

J. P. NIKONOW,
New York City, N. Y. Engineer and Patent Attorney.

Finds Fault with Remuneration Offered for Experienced Electrical Engineer

To the Editors of the ELECTRICAL WORLD:

The writer has noted with much interest an advertisement in a recent issue in which one of the large financial companies advertised for the services of an electrical engineer, who is to be between the ages of thirty and forty and to have good technical knowledge and experience, the salary $350 per month, residence New York City. One is forced to wonder just what type of engineer the firm expected to employ at that salary. How can the standing of the electrical engineering profession be raised to the standing of other professions if the larger concerns such as the one advertising are willing to pay only the salary mentioned—if they really wanted an experienced engineer?

Wilmington, Del. B. P. FOSTER.

Adoption of American Codes and Standards in Foreign Countries

To the Editors of the ELECTRICAL WORLD:

We read with interest your article on "The Power Club Hears Swope" on page 1145 of the ELECTRICAL WORLD for May 31. It is noted that in the discussion regarding opportunities for marketing American electrical products abroad it was urged that American codes and standards be widely distributed abroad. It may be of interest to the American electrical trade that there is a movement under way for the adoption of some form of electrical standardization in this country, and we have made some efforts to bring about the adoption of American standards. There have been a number of sessions between the municipality of Lima and the principal electrical dealers here at which a temporary code was drawn up, but as yet this has not been officially approved, and at the present writing there is no definite code in force. Our efforts have been along the lines of supplying such data regarding American codes and standards as we had available.

We are confident that much can be done toward the adoption of American codes and standards in Peru and request that you take this matter up with the proper authorities and supply copies of all American codes and standards directly to the municipality of Lima, or if you would mail the same to us, we will see that they are placed in the hands of the proper individuals. There is no question but that the adoption of American codes here would be mutually beneficial to the American electrical trade in general.

As pointed out above, a suitable code is now in discussion and no time should be lost in pushing the adoption of American standards. L. L. LINDSTROM.

W. R. Grace & Company,
Lima, Peru.

Central Station and Industrial Practice

Changing Insulators on Energized Line

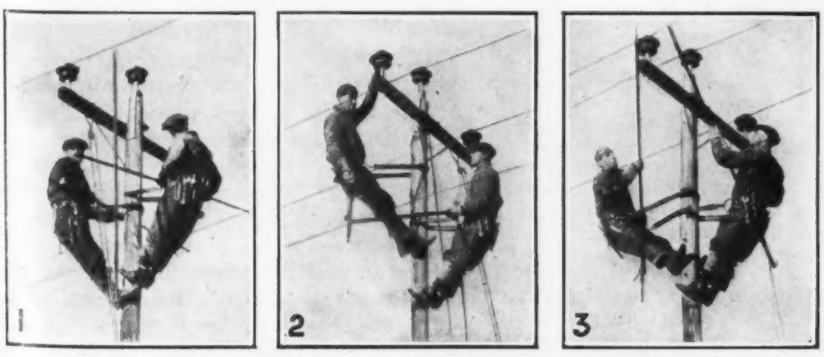
By T. B. Bash
Superintendent Overhead Construction
Kansas City (Mo.) Power & Light Company

BY USING a gang of six men the Kansas City Power & Light Company recently completed the reinsulating of a 52-mile line within seventy-three working days without any interruptions or accidents due to short circuiting. The success of this changeover was due largely to the system of training the linemen and keeping the tools in good condition. This reinsulating was due to a required increase in the line voltage from 13,000 volts to 33,000 volts between Carrollton and Glasgow, Mo. All the pins, ridge irons and insulators were changed while the line was in operation. There were 1,299 poles in the total line with an average height of 30 ft. each, with four-pin cross arms and No. 4 A.C.S.R. wire. Of the gang doing the work a group of three men—two linemen and one groundman—worked on a pole, always leaving another pole between workmen so as to avoid swinging conductors together. The average number of poles changed daily was eighteen, or nine poles per crew of three linemen.

The methods employed by these three linemen may best be described by the following illustrations. In Fig. 1 is shown how the pole was cleared to install new ridge irons and pins. One phase wire is tied out from the pole by means of a specially treated cord hand line. While one lineman holds another wire clear with a small jaw claw, the other lineman installs the ridge iron, pin and insulators. Then the line held out by the jaw claw is put back on the ridge pin in permanent position; the wire which was tied off by the cord hand line is also replaced. The remaining wire is held away from the pole by one lineman, using this jaw claw as in Fig. 2, until his partner has changed both the pin and insulator. The tying of phase wires to insulators is shown in Fig. 3, where one lineman holds the wire tight on the insulator until the other lineman fastens his end of the wire. Then the process is repeated from the other side. To speed up this work the tie wires are mounted direct to the insulator on the ground and then hauled up.

The safety equipment is also used on changeovers of corners, terminal poles, dead ends and on lightning arresters.

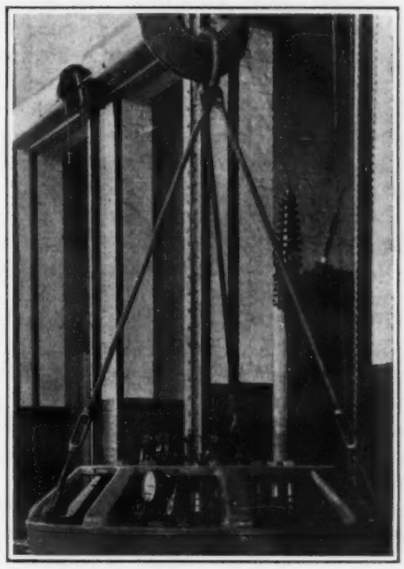
Very few conditions have arisen where the line tools could not be used on circuits ranging from 13,200 volts to 33,000 volts without any interruption of service. This gang has now been operating for about two and one-half years without any serious accidents or interruptions during that time. This is due to the company's policy of taking no chances either in the training of the men or with the equipment used for this work. All equipment is tested in the laboratory for high-voltage breakdown and when properly used is considered just as safe as when working on 2,300-volt or 4,000-volt circuits.



TYPE OF TOOLS AND PROCEDURE IN REINSULATING 52-MILE LINE IN SEVENTY-THREE DAYS

Tripod for Lifting Exciter Facilitates Handling

AT THE Cabot hydro-electric station of the Turners Falls (Mass.) Power & Electric Company the tripod frame illustrated herewith was devised by L. A. Fitts, assistant superintendent of power,



FORGED BARS WITH RINGED ENDS STABILIZE LIFTING FIELD RING

to facilitate the raising and lowering of 150-kw. exciter field frames in performing maintenance work upon the generating units in this plant, or in doing other construction tasks. Under ordinary conditions it is inconvenient to attach chains and hooks to such a field frame when it becomes necessary to lift a frame clear of the armature mounted on the vertical shaft of the unit. Even when this is done there is often difficulty in obtaining a balance good enough to avoid tilting the frame and perhaps rubbing the pole pieces against the armature coils, with resulting damage to the coils.

By the arrangement shown, three 1¼-in. wrought-iron bars, 8 ft. long and attached by eyes to a ring at the upper ends, form a tripod, the lower ends of which are fitted with turnbuckles, into which are screwed forged U-shape bars. These U-ends form hasps which are secured to eye-bolts by 1-in. pins with cotters

to prevent slipping, the eye-bolts being screwed into the field frame at the regular bolt holes. By this means a frame can be lifted clear of the armature and maintained level throughout the process. The tripod collapses when not in use and takes up little space.

Effect of Brush Drop on Circulating Currents in Converters

BY JOHN W. JONES
Station Engineering Department, Philadelphia Electric Company

THE presence of excessive circulating current in the neutral connection between machines on a three-wire Edison system led to an investigation to determine the cause. In one case the circulating current was sufficient to reduce the station capacity by 1,000 amp. As a result of this study the root of the trouble was found in a difference between the positive and the negative brush contact drop. This is because the current in one case flows from the commutator to the brush and in the other case in the opposite direction —from brush to commutator. With different grades of brushes this difference varies greatly in magnitude and direction; that is, some grades show a higher drop on the positive side than on the negative, while other grades show greater drop on the negative side.

The results of measurement of the difference between positive and negative brush drop for several grades of brushes used on a number of machines are given in the accompanying table. These measurements were taken with the positive and the negative brushes carrying the same load and having the same spring pressure. The load in each case was near the full rating of the machine.

The effect of this difference in brush drop on synchronous converters with neutral taps taken from their transformers is to cause an unbalanced voltage to neutral. If the same unbalance in voltage does not exist on all machines run in parallel, there will be circulating current in the neutral connection between machines. The magnitude of this circulating current will be such that the resulting drop will just equal the difference in voltage unbalance. This unbalanced current flows through the neutral connection from one machine to another, seeking a path through the machine sides having the tendency for the greatest voltage. This current has been observed to amount to as much as 12 per cent of the machine's capacity.

This condition of unbalance limits the available machine capacity considerably, since the load on each machine is restricted to full-load current on the heavily loaded side. Extra losses are introduced by the flow of circulating current through the neutral connection between machines, and the efficiency of the converter is reduced on account of the unbalanced load.

The remedy for such a condition is to adjust the brush drops so that the same difference between the positive and the negative brush drops exist on all machines run in parallel. This may be accomplished in several ways:

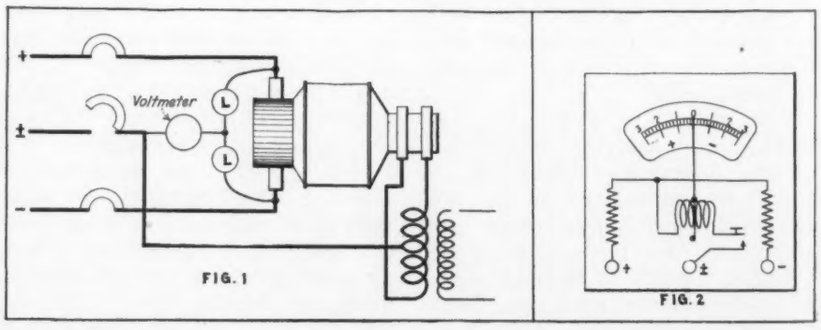
1. The brush pressure may be made different for the two polarities. This method is apt to result in chattering, sparking, excessive wear or heating.
2. The current density may be made different for the two polarities by removing some of the brushes. This method may overload some of the brushes.
3. The distribution of current in the face of the brushes may be changed by shifting the brush rocker arm. This method may sometimes be used, but it is not very satisfactory, since the brushes can be moved only a slight amount without interfering with the voltage range and commutation.
4. The grade of brush may be changed so that a similar difference in brush drop is obtained on all machines run in parallel. It is not necessary to use the same grade on all machines. However, as far as the elimination of circulating current is concerned, it is usually desirable to do so. This method offers the greatest range of adjustment and it is by far the best of the methods that have been enumerated.

While this article deals principally with rotary converters, it will apply equally well to three-wire generators having a neutral taken from the midpoint of a coil connected across their armature winding. The action is the same as for a converter having neutral taps from its transformer winding.

The actual brush drop for a machine in operation cannot be readily measured because of the difficulty in making satisfactory voltmeter connections with the commutator. Any connection with the moving commutator introduces an uncertain drop. Added to this is the trouble of locating the connection so that it will give the proper average for the voltage of the commutator, whose potential is different at every point across the face of the brushes.

The difference in brush drop, on the other hand, may be readily measured by taking readings between stationary parts of the machine. The voltage from the positive and the negative brush arms to neutral can be measured with a voltmeter and the difference taken. With this method, however, the voltages measured are so large in comparison with the difference involved that an accuracy greater than one-half of a volt is not easily attained. For this reason another method was developed that gives much closer results.

This method makes use of a low-range direct-current voltmeter (0 to 3 volts) and two approximately equal resistances (100-watt lamps). The resistances are connected in series and placed across the positive and negative brush arms as shown in Fig. 1. The neutral circuit breaker is opened and a voltage reading taken between the transformer neutral tap and the connection between the two resistances. The connections to the brush arm are then reversed and another reading taken. It is usually necessary also to reverse the voltmeter connections. If this is done, one reading must be considered nega-



METHOD OF MEASURING DIFFERENCE OF VOLTAGE DROP BETWEEN BRUSHES

DIFFERENCE BETWEEN VOLTAGE DROP AT NEGATIVE AND POSITIVE BRUSHES

Grade of Brush	Machine	Polarity of Brush With Highest Drop	Difference in Drop, Volts
A	1	Positive	1.75
B	1	Positive	0.01
B	2	Positive	0.14
B	3	Negative	0.04
B	4	Negative	0.18
C	5	Positive	0.09
C	6	Positive	0.39
C	7	Positive	0.04
D	8	Positive	0.38
E	9	Negative	0.23

tive. The algebraic sum of the two readings gives the difference in brush drop. With this method it is easily possible to obtain readings to the hundredth part of a volt. These readings are not strictly accurate, however, on account of the current taken by the voltmeter, but this is of no importance when only relative figures are needed for comparing brushes. The neutral breaker is opened to eliminate any drop due to direct current in the neutral tap and to insure equal load on the positive and the negative brushes.

Testing by this method is greatly facilitated by the use of reversing switches. Still further simplification may be obtained by the use of a special zero center portable voltmeter with resistances internally mounted as shown in Fig. 2. The scale can be calibrated to give a direct reading of the difference in drop. With this instrument only one reading is necessary and no connections need be reversed. Such a meter is now in use and the operation is quite satisfactory.

As a result of the test for difference in drop, control over the troublesome condition of circulating current through the neutral has been obtained. Several cases have been practically cured by changing the brushes. Data obtained by the new test method were the guide for selecting the proper brushes, and the predicted operation was substantiated in actual performance. All users of synchronous converters with neutral taps will find the test valuable as a means of avoiding as well as eliminating trouble.

Socket and Switch Testing Apparatus

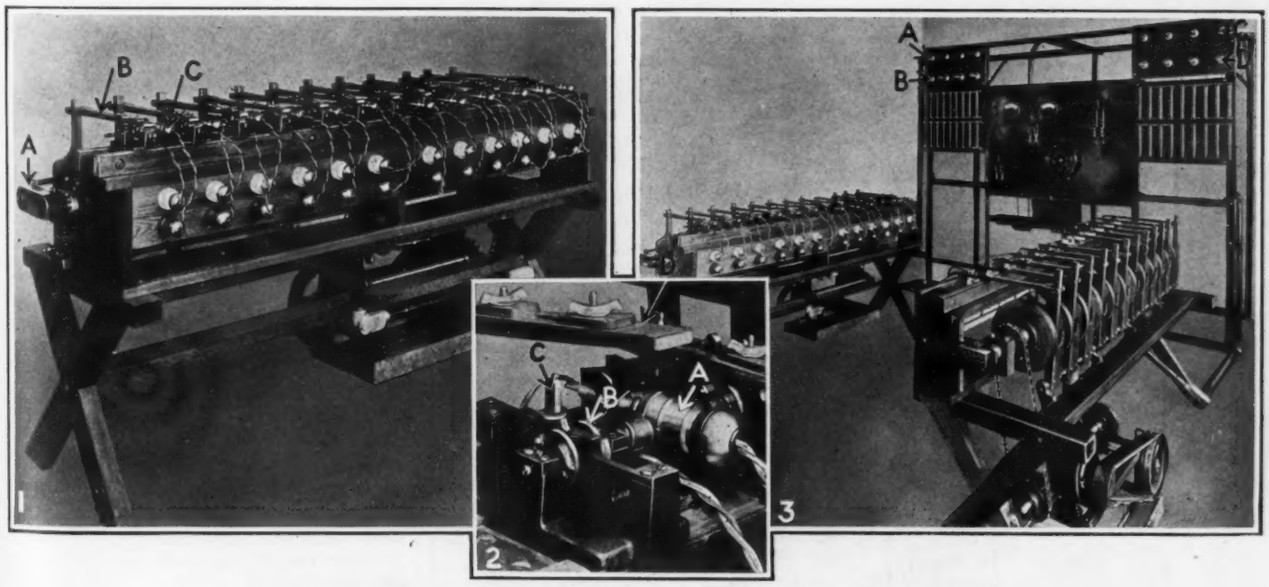
IN RECENT years practically every large manufacturer of electrical devices has come to realize the growing importance of proper testing equipment for his product. As an example of this, every lamp socket, switch or other device operated by means of a spring-actuated mechanism for making and breaking the circuit must be tested on a 250-volt circuit for overload, endurance and heating before being accepted for general use.

In the past many machines have been developed for operating devices to be tested under fixed load, but perhaps one of the most interesting developments has been a socket and switch testing machine by Harvey Hubbell, Inc., Bridgeport, Conn.

This testing equipment consists of one or more units similar to that shown in Fig. 1. It has a wooden frame, 7 ft. long, on which is mounted a motor-driven shaft carrying twelve side slotted cams which serve to give twelve extending wooden arms a push-and-pull, or rectilinear, movement.

Because of its many advantages for an electrical machine of this type seasoned hardwood was selected for the frame, and wherever practicable for other parts. Its use eliminates any possibility of short circuiting and, notwithstanding the many moving parts of the machine, assures almost noiseless operation. The arms, or connecting rods, operate at right angles over a frame, or ladder piece, which extends the length of the machine at the top. This frame has secured to the top surfaces of the side bars metal straps electrically grounded.

The method of applying the attachment for holding and operating key sockets for testing is shown in Fig. 2. These attachments are made in various forms, and with their aid practically every kind of a device can be tested on this one machine. The key socket attachment, for example, transforms the rectilinear movement into a rotary movement, and the attachment for pull sockets revolves a disk on which is fastened a means



APPARATUS THAT INSURES RAPID AND RELIABLE TESTING OF LAMP SOCKETS

Fig. 1 — Complete machine for testing twelve wiring devices simultaneously. A. Comptometer for recording number of movements. B. Horizontal arm for operating device under test. C. One of the twelve key lamp sockets being tested.

Fig. 2—Close-up of one of the lamp sockets under test. A. Socket. B. Attachment for operating key sockets. C. Attachment fitting to which slotted arm is clamped. D. Slotted operating arm.

Fig. 3 — Equipment of two units with switch board. Twelve key sockets are being tested on the machine at the left and six flush toggle switches and six surface toggle switches on the one at the right. A, B, C and D are indicator lamps for respective machines. When defects or trouble develop with any device under test, two of a lower group of white lights go out and the other two become brighter.

for holding the chain. This machine successfully tests toggle switches.

It will be noted in Fig. 1 that on the face of the machine are two half-length boards. On the back of these boards are two sets of bus bars, one set connected to the energy source and the other set connected to the Ward-Leonard resistance units mounted on the switchboard, Fig. 3. By means of these units 0.5-amp. and 1-amp. loads can be built up as required. If finer graduations are wanted, the resistance box as shown below the middle panel of the switchboard in Fig. 3 can be used.

Overhead Distribution Construction

Standardized Practice as Developed and Used by the
WEST PENN POWER COMPANY, PITTSBURGH

Mounting and Wiring for Meter Installations

WATT-HOUR meters shall ordinarily be mounted on a meter board of $\frac{7}{8}$ in. dressed lumber at least 12 in. wide for single-phase, and at least 18 in. wide for polyphase meters. and sufficiently high to accommodate both the meter and safety switch. A space of 11 in. for single-phase and 18 in. for polyphase meters shall be available above the top of the safety switch for mounting the meter only. This board will be furnished by the customer, and, if possible, shall have a clear space of 6 in. on all sides. The meter board shall be securely fastened to some substantial support free from shock or vibration and should be painted to prevent warping. The meter board may be made of any approved insulating material.

The meter shall be securely fastened to the meter board by three No. 10, 1-in., round-head, blued or sherardized wood screws.

No meter board is necessary when the meter is mounted on customer's switchboard, on a steel meter-mounting box, or in a standard wood meter box, either indoors or outdoors.

Always check all connections after completing the meter installation. Be sure that meter is not cross-phased or reversed and that all current coils and current transformers are in non-grounded wires. "Ring" or "light" out the leads if they are conduit or cannot easily be traced.

Always check size of meter against current and potential transformers and carefully record same if they do not agree, so that the constant can be taken into account in billing the customer, until the installation is corrected.

All meter and terminal covers, as well as safety switches and conduits drilled for seals, shall be sealed. No meter seals shall be broken except by authorized employees who are supplied with sealing tools and who shall always reseal each meter before leaving premises. No person except an authorized meter inspector shall attempt to adjust or repair any watt-hour meter.

Connection to Grounded Wire.—All 115-volt and 230-volt secondary circuits shall be grounded in accordance with the rules given on page 1136 of the ELECTRICAL WORLD for May 31, 1924. It is essential that only non-grounded wires of circuits be connected through current coils of meters. Where current transformers are used they shall be connected in non-grounded wires or circuits.

To determine which is the non-grounded wire use a test lamp or voltmeter, connecting one side to a water pipe or other good ground connection and test to the line wires of the meter loop. The wire that causes the lamp or voltmeter to show voltage is the non-grounded wire and should connect to the current coil of the meter. When testing circuits, be sure that the lamps or voltmeter will stand 230 volts without damage.

Current and Potential Transformers on Circuits Less Than 15,000 Volts.—Current and potential transformers shall be firmly mounted on pipe or steel frames where practicable. When mounting potential transformers on wood, sheet asbestos shall be placed between the transformers and the wood.

Current and potential transformers shall be protected by lightning arresters. If there is no such protection, current transformers shall have spark gaps in parallel with them as shown in Fig. 82.

Fuses shall not be used on meter potential transformers for 15,000 volts or less. Where fuses are used on higher voltage potential transformers, they shall be not less than 1½-amp. capacity. The fuses shall be mounted where accessible for renewal and where there will be no danger from the arc when blown. Potential transformers having fuses shall have 10-watt, 130-volt pilot lamps across their secondaries to indicate when there is potential on the transformers, as shown in Fig. 83.

The current transformers shall be so mounted that the name plates can be read without danger when power is on. The current rating shall be stenciled on the transformer where it can be read without danger.

One side of the secondary of each potential or current transformer used on circuits over 1,000 volts shall be grounded in the same manner as indicated on page 1190 of ELECTRICAL WORLD for June 7, 1924.

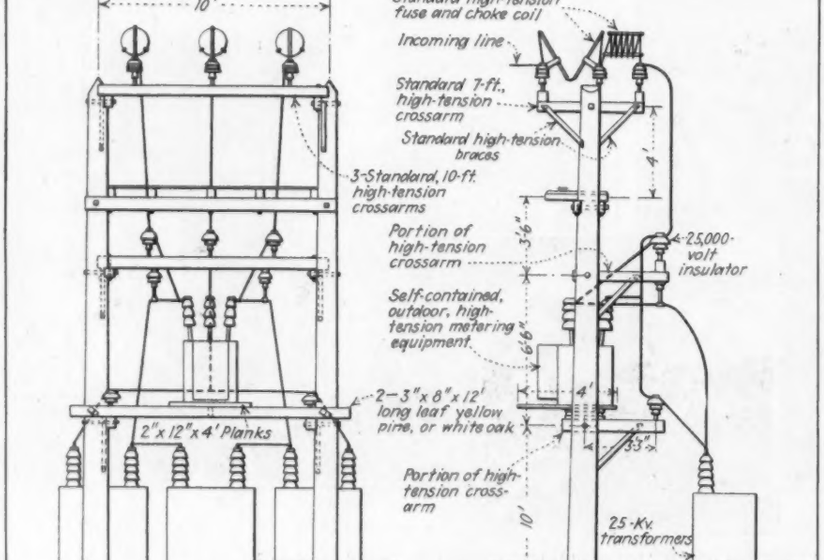


FIG. 81—METER MOUNTING FOR HIGH-TENSION METERING EQUIPMENT

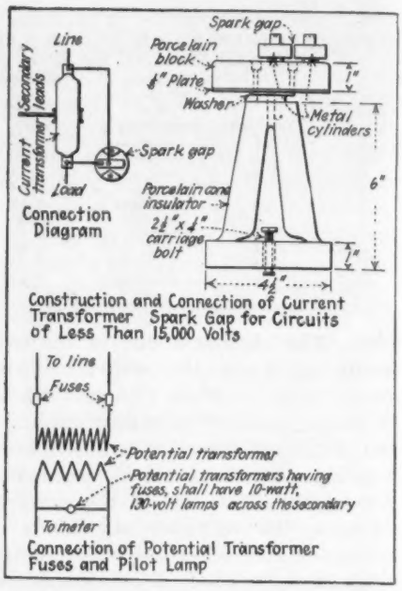


FIG. 82—PROTECTING INSTRUMENT TRANSFORMERS BY SPARK GAP

Central Station Business

Non-Merchandising Utility Advertises Appliances

ALTHOUGH the United Electric Light Company, Springfield, Mass., has not merchandised electrical appliances for a considerable period, the policy of the company is to co-operate in local advertising of such products and to share in movements to interest the public in the use of domestic labor-saving equipment. Not long ago the company

What Springfield Housewives Say About

ELECTRIC RANGES

Anxious to get a frank expression from Springfield Housewives who own Electric Ranges on the satisfaction they are giving, we have asked them to tell us all about their ranges—whether or not it is giving satisfaction, how its cost of operation compares with that of other stoves and what features about their range they like best. We have received replies from a considerable number of these owners of Electric Ranges and their replies we have reprinted in a little booklet under the title

"Unbiased Testimony"

And we will be pleased to mail you a copy upon request.

Electric Fans

In justice to yourself and your family you have no right to endure the discomforts of this super-hot weather when an Electric Fan will bring you absolute comfort in the Home, the Office and the Factory at a trifling cost.

You can buy Electric Fans from $5. and the cost of running them averages less than half a cent an hour

Electric Refrigerators

A few years from now you will wonder how you put up with a wet dripping refrigerator filled with pond ice.

The modern Electric Refrigerator, as now perfected for domestic use, gives you a sustained low temperature, without a particle of moisture, preserving your food perfectly and at a cost of operating less than the cost of natural ice.

United Electric Light Co

CO-OPERATIVE APPLIANCE ADVERTISING BY CENTRAL-STATION COMPANY

took part in maintaining an electrical appliance exhibit in a store rented for a week in the downtown district and occupied by a number of dealers and manufacturers' representatives. The accompanying newspaper advertisement featuring electric ranges, fans and refrigerators is a typical contribution of the company's to the local merchandising situation.

Utility Week a Success

PIONEERING in a new kind of week—"Utility Week"—three divisions of the Central Illinois Public Service Company, namely Hoopeston, Mattoon and Paris, Ill., successfully carried out a program which will likely be conducted more extensively next year, especially in places where the company has power stations or substations.

Special days were set aside for customers, school children and clubs, with safety day being combined with either the school or customer day. First, notices were sent out with the customers' bills notifying them of customer day and extending a cordial invitation to them and their families to visit the company's properties on that day. Special invitations were then extended by the company's superintendents to all civic clubs, and to the superintendent of schools for the school children to visit the plant and for arrangements for safety talks.

With the invitation to the superintendent of schools, there was a supply of folders announcing prizes for the three best essays written by the pupils of the schools of each town, one prize for the pupils below the sixth grade, one for the pupils in sixth, seventh or eighth grade and the third for those attending high schools.

The day prior to the first special day a page advertisement was run in each of the newspapers to remind every one of the invitations that had been extended. Rainy and disagreeable weather did not keep the people away.

More than 250 essays were written by the pupils. All of the essays indicated an excellent understanding of the trips through the plants. The safety talks were well received and practically every school child in the three towns heard about how to practice safety.

Cost of Using Electric Ranges

Analysis of Ninety-five Customers' Bills Shows Cost of Cooking Electrically to Vary Between 50 Cents and $1.33 a Person per Month, Depending Upon Number in Family

COOKING by electricity is not expensive, according to the Iowa Railway & Light Company, which supports its statement by data showing the actual monthly cost of operating ninety-five electric ranges on its system. But it is difficult to sell them at the present prices, the company finds, and it says that no campaigns will be attempted until the prices come within reason. Utility managers quite generally believe, says Arthur Huntington of this company, that present prices are at least 50 per cent higher than they should be in most cases.

Tests have been conducted to ascertain how much overlap there is between range loads in strictly rural communities and peak loads in manufacturing communities.

Curve A was taken on the 6,600-volt side of the substation in the town of Keystone and shows the worst overlap observed in sixty days' readings taken with a recording wattmeter. Curve B is the minimum load on the Cedar Rapids steam plant and also the maximum load for the month of June, 1922. Curve C is the maximum load condition and the minimum-load condition in December, which would show the maximum chance for overlap. This peak is thirty minutes ahead of any other peak and was caused by a large manufacturer operating overtime. Curve D shows the maximum and minimum load on the various steam plants during the month of December. Curve E shows the maximum and minimum loads on various steam plants for the month of June. Curve F is a composite curve of all the steam plants. This curve shows very plainly the advance of the peak of December, 1921, which was caused by the manufacturing plant above referred to. It may be noted that, aside from conditions on this one day, which would have been avoided if it had been necessary to do so, there was no overlap between the ranges and the peak. This condition will remain unchanged up to approximately 5,000 ranges. After that number have been installed the ranges will begin to create peaks of their own.

The monthly energy costs of operating electric ranges, which are summarized here, were taken from the customers' records and can be verified. Twenty-two of the installations are in Tama, nineteen in Toledo, twelve in Reinbeck, nine in Gladbrook and thirty-three in Keystone, Iowa.

The average connected range load per customer in these five towns is 5,034 watts, being highest in Reinbeck, with an average of 5,760 watts. The average number of persons per family in all five towns, based on an actual census of the families using these ranges, is three and four-tenths

Cost of Using Electric Ranges as Shown by the Monthly Bills of 95 Range Customers

Average for Following Towns:	Connected Wattage of Range	Number in Family	Electric Range Bills — Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average Bill per Month	Average Bill per Person per Month	Average Kw.-Hr. per Month
Keystone	5,350	3.6	$4.63	$4.36	$3.91	$4.61	$4.73	$4.37	$4.24	$4.29	$4.78	$5.04	$4.77	$4.83	$4.44	$1.36	100
Tama	4,909	3.4	3.60	4.28	3.68	3.77	4.78	3.94	4.38	4.70	4.00	4.04	3.64	3.77	3.72	1.21	75
Toledo	5,210	3.6	3.82	4.25	4.37	4.54	4.75	4.12	5.54	4.71	4.79	4.63	4.76	4.66	4.59	1.35	92
Reinbeck	5,760	3 4	5.22	3.94	3.87	3.97	4.57	5.17	4.96	5.23	5.45	3.82	3.30	4.11	4.29	1.41	74
Gladbrook	3,944	3.2	5.65	5.75	5.50	6.55	5.85	3.68	4.05	4.50	3.62	4.36	4.02	4.00	3.95	1.33	69
Average for 95 ranges	5,034	3.4	$4.58	$4.51	$4.26	$4.68	$4.93	$4.23	$4.63	$4.68	$4.52	$4.38	$4.29	$4.27	$4.19	$1.33	82
KEYSTONE	6,490	3	.....	.....	.....	.....	.....	$7.44	$2.50	$4.99	$7.13	$2.50	.....	.....	$4.91	$1.63	108
	7,000	3	$5.26	$4.82	$3.56	$3.57	$4.91	3.81	4.54	5.72	4.91	6.81	6.07	2.50	4.70	1.56	136
	6,490	3	3.16	2.83	2.84	3.48	3.24	3.29	4.54	3.42	3.58	2.50	4.81	3.81	3.45	1.15	86
	6,000	4	10.29	2.64	2.64	2.50	2.70	2.50	4.38	2.50	2.50	2.63	3.69	4.30	3.60	0.90	69
	5,240	3	4.66	3.16	3.24	3.97	3.60	3.05	3.16	2.84	3.38	3.81	3.41	5.35	3.60	1.20	97
	5,000	5	.....	.....	.....	.....	.....	.....	.....	3.97	4.01	4.02	4.37	3.86	4.04	0.80	86
	7,000	3	6.24	6.89	5.88	10.90	9.31	2.50	4.30	7.94	8.67	7.83	6.93	11.31	7.38	2.66	190
	5,240	2	2.50	2.50	2.50	2.50	2.51	2.50	2.50	2.50	3.12	2.64	2.50	2.50	2.55	1.27	55
	6,000	4	.....	.....	.....	.....	.....	.....	.....	3.65	2.50	.....	.....	.....	3.37	0.84	61
	6,000	3	2.50	2.50	2.50	2.76	3.63	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.61	0.87	41
	4,500	4	.....	.....	.....	.....	.....	.....	2.83	2.50	2.50	.....	.....	.....	2.61	0.65	51
	5,000	3	3.81	3.33	3.81	4.70	4.13	3.37	2.64	2.50	2.50	3.55	6.62	6.62	3.96	1.32	86
	5,000	4	5.71	4.05	5.03	6.85	5.30	5.80	4.86	5.76	7.50	3.05	9.08	6.00	5.74	1.43	142
	5,240	3	5.83	7.02	5.59	6.20	6.81	5.27	10 50	2.50	3.81	11.47	6.40	10.34	6.81	2.27	153
	6,490	8	12.80	2.50	7.02	8.02	7.82	8.51	8.83	5.43	5.80	14.10	6.81	7.21	7.90	0.98	183
	5,240	2	4.09	5.31	4.14	4.90	7.13	6.77	5.31	5.11	5.48	5.17	5.22	4.78	5.28	2.64	129
	6,490	8	.....	.....	.....	.....	5.72	2.98	4.46	5.11	4.47	7.10	2.43	2.50	4.34	0.54	102
	4,000	3	.....	.....	.....	.....	.....	2.50	2.50	2.50	2.50	.....	.....	.....	2.50	1.25	20
	3,510	2	4.29	8.19	2.50	2.64	4.66	2.57	2.50	2.60	3.61	2.50	3.41	5.02	3.71	1.85	96
	5,240	4	2.50	2.50	2.50	2.65	2.79	4.38	6.65	6.53	4.75	7.34	2.51	2.50	3.96	0.99	90
	5,240	9	3.56	2.50	2.50	2.50	3.24	8.91	8.43	8.47	6.62	5.51	5.80	7.38	5.45	0.50	123
	5,240	4	4.13	5.92	3.53	3.00	3.94	4.38	3.29	3.86	7.43	4.26	2.50	6.01	4.35	1.08	104
	4,000	5	2.50	2.50	4.02	2.50	3.37	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.69	0.54	36
	5,000	3	3.04	4.59	2.61	3.97	3.52	4.86	2.80	3.65	7.38	2.50	2.50	2.50	3.66	1.22	77
	6,000	3	.....	.....	.....	.....	.....	.....	4.62	4.98	4.98	5.13	9.56	4.54	5.63	1.87	137
	6,490	3	7.13	11.26	8.67	10.61	9.30	7.01	4.34	7.21	7.21	10.89	10.82	8.72	8.59	2.89	210
	4,230	6	2.80	2.50	3.68	3.00	6.72	2.50	2.29	6.16	5.03	4.26	3.77	3.49	5.51	0.91	95
	6,490	2	2.64	3.97	2.84	3.24	3.44	5.06	4.02	3.65	7.65	2.50	2.50	2.51	3.66	1.83	86
	5,240	2	3.32	5.80	5.03	5.96	5.63	5.75	5.84	2.50	10.13	6.73	5.75	6.38	5.73	2.86	138
	5,240	2	3.61	3.65	3.05	7.61	2.76	2.50	2.50	2.50	4.19	3.53	4.01	3.45	3.61	1.80	83
	3,000	4	.....	.....	.....	.....	.....	2.50	2.97	3.00	2.50	.....	.....	.....	2.74	0.68	61
	4,000	5	.....	.....	.....	2.50	2.50	3.16	5.23	5.23	3.20	2.56	2.50	2.50	3.26	0.65	64
	5,240	3	4.82	4.10	4.26	4.74	4.45	8.02	2.50	4.70	2.88	6.29	4.78	4.26	4.64	1.54	109
REINBECK	6,000	4	$10.55	$8.53	$7.25	$8.25	$8.50	$9.75	$8.30	$8.40	$9.75	$7.15	$8.00	$8.00	$8.54	$2.13	171
	5,000	2	2.75	2.75	2.75	3.20	4.15	2.75	2.75	2.75	2.95	2.75	7.45	2.75	3.31	1.65	56
	6,000	4	5.70	6.75	5.60	6.90	7.35	8.25	9.05	7.65	9.30	5.75	7.65	7.60	7.29	1.82	179
	6,000	2	2.75	2.75	2.75	2.75	4.10	4.15	3.60	3.70	4.05	4.05	2.75	2.75	3.34	1.67	54
	5,000	2	.....	.....	.....	.....	.....	2.75	2.75	5.81	2.75	2.75	2.75	2.75	3.18	1.59	33
	6,000	5	16.75	3.50	5.55	2.85	2.75	2.75	4.85	2.75	3.90	4.45	6.10	3.50	4.99	0.99	93
	5,000	4	2.75	.....	.....	.....	.....	.....	.....	.....	6.85	3.60	2.75	.....	4.40	1.10	72
	6,000	2	2.75	2.95	2.75	3.55	2.75	7.40	3.30	7.90	7.90	2.75	2.75	.....	3.89	1.94	74
	6,000	3	2.75	2.75	2.75	2.75	6 03	6.02	6.80	5.20	4.30	2.75	2.75	2.75	3.96	1.32	50
	6,000	8	2.75	2.75	2.75	2.75	2.75	2.75	.....	5.40	.....	2.75	2.75	2.75	3.01	0.37	30
	6,000	3	2.75	2.75	2.75	2.75	2.75	.....	.....	.....	.....	.....	.....	.....	2.75	0.91	35
	6,000	2	.....	.....	.....	.....	.....	.....	2.75	2.75	2.75	3.30	.....	.....	2.88	1.44	51
TAMA	6,000	5	.....	.....	.....	.....	.....	.....	$2.30	$2.61	$3.29	$2.75	$3.25	$3.50	$2.95	$0.59	60
	6,000	3	.....	.....	.....	.....	.....	.....	4.25	5.04	4.10	4.45	4.55	4.10	4.47	1.47	91
	3,500	4	.....	.....	.....	.....	.....	$2.75	3.60	4.55	4.28	2.75	2.75	2.75	3.34	0.83	55
	6,000	4	.....	.....	.....	.....	.....	.....	2.75	2.79	3.51	2.75	2.75	2.75	2.85	0.71	52
	4,000	4	$3.65	$4.86	$3.60	$5.22	$5.00	2.75	5.20	5.04	3.87	4.70	5.20	4.45	4.46	1.11	93
	4,000	3	2.66	2.48	3.02	2.75	3.33	4.28	2.75	3.29	2.75	3.70	3.20	3.20	3.11	1.03	63
	6,000	4	.....	.....	.....	.....	5.13	4.28	4.19	6.48	5.54	6.85	3.15	8.35	5.48	1.37	117
	4,000	4	.....	.....	.....	.....	.....	.....	2.75	3.30	2.90	2.75	3.20	2.90	2.95	0.69	52
	4,000	2	4.39	5.67	5.99	4.37	6.84	6.44	7.83	3.69	4.68	3.20	3.40	2.85	4.94	2.47	74
	6,000	3	.....	.....	0.55	2.75	2.84	3.92	6.89	7.29	2.75	2.75	2.75	2.75	3.52	1.17	70
	2,500	2	.....	.....	.....	.....	.....	1.40	4.01	5.58	2.75	.....	.....	.....	3.43	1.71	63
	9,000	4	4.39	5.67	5.99	4.37	6.84	6.44	7.83	5.18	8.52	8.52	6.40	7.70	6.48	1.62	139
	6,000	2	.....	.....	.....	3.78	4.00	2.75	2.75	2.75	2.75	5.00	6.20	2.75	3.63	1.86	62
	4,000	4	2.95	2.75	2.75	3.20	4.32	4.46	4.23	8.28	4.41	2.75	3.30	2.75	3.84	0.96	77
	5,000	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3.60	3.60	1.20	72
	4,000	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	2.75	2.75	2.75	2.74	1.37	46
	5,000	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2.75	2.75	1.37	46
	5,000	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.75	5.10	5.05	3.63	0.73	76
	5,000	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2.75	2.75	1.37	49
	5,000	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	8.30	2.75	2.75	4.60	0.92	169
	7,000	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.25	6.00	3.62	0.73	72
	1,000	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2.75	2.75	1.37	24
TOLEDO	4,000	5	$2.75	$2.75	$2.85	$2.75	$2.75	$3.28	$7.02	$6.43	$7.20	$3.40	$2.75	$2.75	$3.89	$0.77	69
	2,500	2	2.79	3.28	3.33	3.69	3.33	2.75	2.88	2 93	2.97	3.80	4.05	3.50	3.27	1.63	70
	4,500	4	.....	.....	.....	.....	.....	.....	3.78	2.84	5.48	5.00	5.50	3.95	4.42	1.10	91
	4,500	2	.....	.....	.....	.....	.....	.....	4.36	3.73	2.75	5.20	6.80	5.90	4.79	2.38	83
	3,000	2	.....	.....	.....	.....	.....	.....	.....	.....	3.33	2.75	2.75	2.75	2.89	1.44	38
	4,500	4	6.50	5.00	4.20	4.30	5.80	0.04	4.27	6.08	6.30	2.75	2.45	6.75	4.53	1.13	103
	4,000	6	3.25	3.45	3.50	3.75	.....	4.77	9.45	4.68	9.45	8.10	7.25	4.40	5.64	0.64	114
	6,000	6	.....	.....	.....	.....	.....	2.40	7.20	7.29	6.84	6.55	6.75	8.20	6.46	1.07	133
	3,000	4	2.75	2.75	3.80	4.70	6.90	6.53	3.15	2.75	2.75	2.75	2.75	2.75	3.69	0.92	63
	5,000	5	.....	.....	.....	.....	.....	0.65	5.94	6.34	4.95	2.75	2.75	2.75	3.73	0.74	68
	6,000	3	.....	.....	.....	.....	.....	3.00	3.24	2.79	2.75	4.89	5.90	5.40	3.98	1.32	74
	6,000	6	2.75	3.15	5.81	.....	2.83	3.91	9.18	7.02	5.40	6.75	6.90	4.40	5.28	0.88	102
	5,000	3	.....	.....	.....	6.85	6.45	8.32	9.50	7.92	9.00	.....	.....	.....	8.00	2.66	176
	4,500	2	3.96	4.63	2.75	3.33	2.75	8.01	2.75	2.75	2.75	2.75	2.75	4.00	3.59	1.79	67
	6,000	3	5.80	9.05	8.75	7.00	7.00	5.87	4.86	8.37	2.75	8.70	8.00	3.05	6.60	2.20	144
	7,000	4	.....	.....	.....	.....	.....	.....	.....	.....	5.13	8.10	9.40	11 53	8.54	1.13	173
	5,500	2	.....	.....	.....	.....	.....	.....	.....	2.75	4.37	3.40	3.55	4.30	3.66	1.83	76
	6,000	2	.....	.....	.....	.....	.....	.....	.....	2.75	2.75	2.75	2.75	2.75	2.75	1.37	42
	7,000	4	.....	.....	.....	.....	.....	.....	.....	2.75	4.10	3.20	2.75	4.85	3.53	0.71	61
GLADBROOK	5,000	6	.....	.....	.....	.....	.....	$2.75	$5.36	$4.65	$4.65	$3.75	$2.75	.....	$3.98	$0.66	78
	2,000	2	.....	.....	.....	.....	.....	3.45	2.75	3.60	3.25	2.75	.....	.....	3.16	1.58	56
	2,500	3	$5.65	$5.75	$5.50	$6.55	$5.85	5.85	4.32	4.70	6.25	7.95	6.05	$5.00	5.78	1.92	115
	5,000	3	.....	.....	.....	.....	.....	.....	3.02	5.22	2.75	4.75	3.40	2.75	3.66	1.22	65
	4,000	2	.....	.....	.....	.....	.....	.....	2.75	2.75	2.75	2.75	2.75	.....	2.75	0.91	26
	4,000	2	.....	.....	.....	.....	.....	2.70	6.12	3.24	2.97	.....	.....	.....	3.75	1.87	82
	5,000	3	.....	.....	.....	.....	.....	.....	.....	9.09	2.97	2.75	2.75	2.75	4.06	1.35	72
	2,000	5	..	..	.....	.....	.....	.....	.....	2.75	2.80	2.90	.....	.....	2.81	0 56	59
	6,000	3	.....	.....	.....	.....	.....	.....	.....	4.59	4.19	7.30	6.45	5.50	5.60	1.86	76

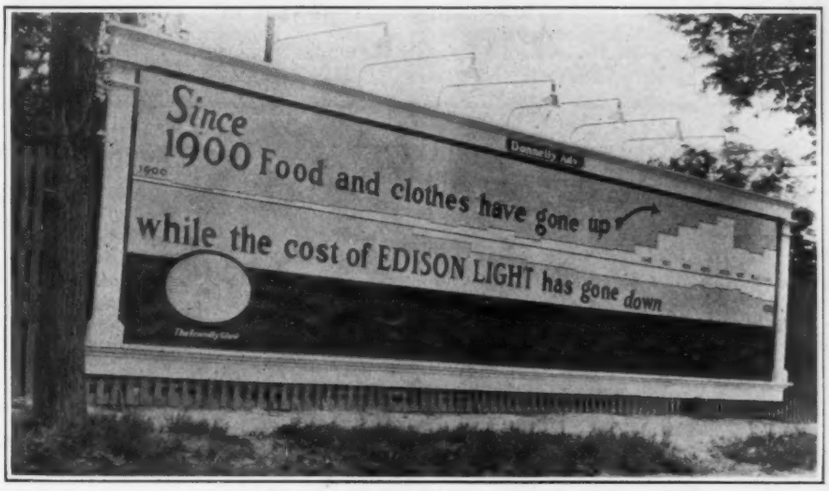
persons. Averaged over the year the monthly bill is $4.19 or $1.33 per person per month. Eighty-two kilowatt-hours of energy is used per month on the average, although Keystone has an average of 100 kw.-hr.

Of the ninety-five ranges forty-three are Estate, thirty-four Hughes, seven Rutenberg, ten Westinghouse and one Weaks. As may be noted, the Gladbrook installations consistently have the highest average monthly bills up to June but the next to the lowest average for the year. The average kilowatt-hours for these installations is also lowest, as is also the average connected load and number of persons per family.

In Reinbeck, which has the highest average connected load per installation, most of the ranges have a connected wattage of 6,000, only three out of twelve being rated at 5,000 watts. At Gladbrook, which has the lowest average connected load per installation, the ranges are rated at 2,000 watts to 6,000 watts.

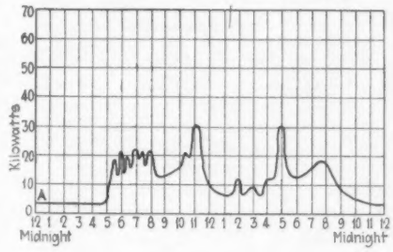
The average number of persons per family for whom meals must be cooked is equal for Toledo and Keystone, but the latter has several families of five or more persons.

Electric Service Costs Diminish Through a Quarter Century



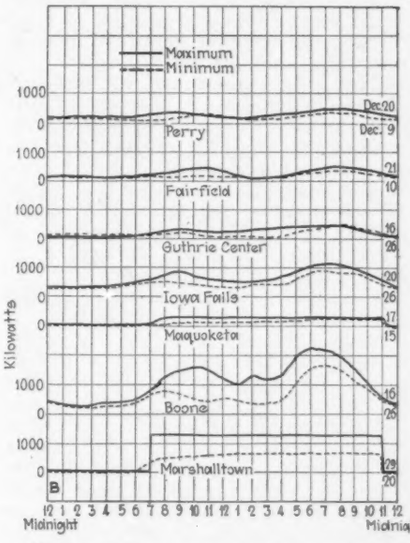
THE economic history of central-station lighting service costs at Boston is effectively contrasted with food and clothing costs in the billboard display of the Edison Electric Illuminating Company illustrated above.

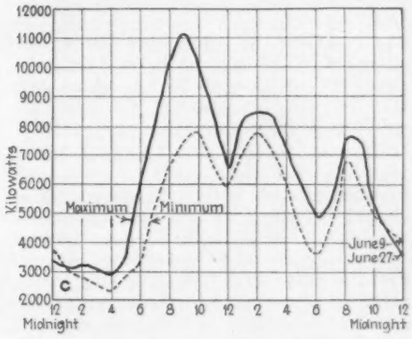
In one family of nine persons the average monthly bill is $5.45, or 50 cents per person per month. In two families of eight the average monthly bill is $7.62, or 76 cents per person. In one family of six the average monthly bill is $5.51, or 91 cents per person. In Gladbrook, where there are three and two-tenths persons per family on the average, the monthly bill is $3.95, or $1.33 per person.

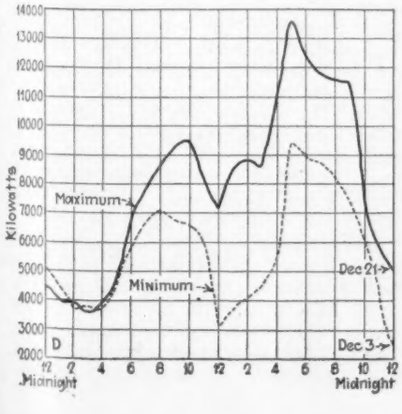


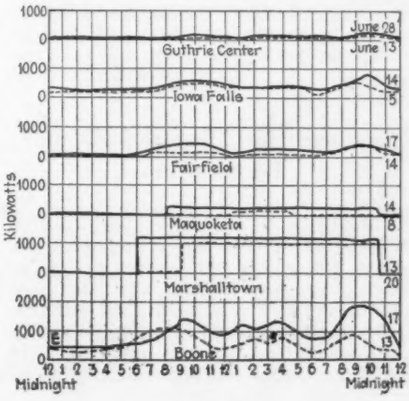
RESULTS OF TESTS TO DETERMINE OVERLAP OF RANGE AND INDUSTRIAL LOAD PEAKS

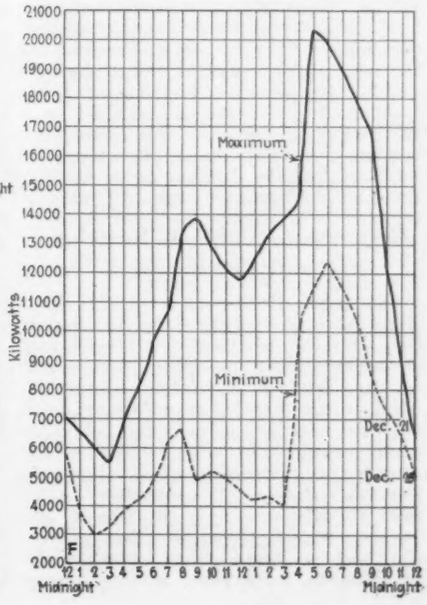
A—Keystone load May 30, 1922. B—Maximum and minimum loads of stations during June, 1922. C—Maximum and minimum loads during December, 1922. D—Maximum and minimum loads on December 21 and December 3 respectively. E—Maximum and minimum loads on June 27 and 9. F—Maximum and minimum system loads on December 21 and December 26, 1922.











Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Photostat copies or English translations of complete articles will be furnished at cost upon request

Hydro-Electric Development and Steam Equipment

Piping Materials, Valves and Gaskets for High Pressures and Temperatures.—J. D. MORGAN.—Since the introduction of high steam pressures and superheated steam as a large factor in economic plant operation, the question of the type and kind of materials best suited for piping, valves, flanges and fittings has caused considerable investigation. However, little real scientific study has so far been made on this subject. The generally accepted conclusions appear to be as described by the author.—*Power*, June 3, 1924.

The Tirso Hydro-Electric Scheme.—About the most important hydro-electric development now in the course of construction in Italy is that on the Island of Sardinia. Due to the extremely small rainfall, a very extensive reservoir project had to be built for the conservation of as much water as possible. A storage dam has been built on the Tirso River, which has a catchment area above the dam capable of holding 416,000,000 cu.m. The power house is situated at the base of the dam and is equipped with two double turbines of 6,000 hp. each, two double turbines of 9,000 hp. each, and a small auxiliary turbine of 60 hp. which provides power for station use.—*Electrical Review* (*England*), June 6, 1924.

Clinker Dam for Grates Using a Movable Ash Door.—W. LULOFS.—According to the author, more attention should be given to the mechanical removing of slag from furnace grates. After a thorough discussion of the factors that must be considered in designing a means of ash removal, the author describes a clinker dam in which the usual dumping bars for banking are maintained, these bars being rigid. They are on the outside of the combustion chamber and, therefore, excellently cooled. The beam, lying just above the grate, is replaced by a door which is movable in a vertical direction. Advantages of this type of construction are pointed out.—*Electrical Times* (*England*), June 19, 1924.

Generation, Control, Switching and Protection

Overload Protection by "Z"-Connected Relays or Trip Coils.—It is now the standard practice of a large number of switchgear manufacturers to put forward triple-pole overload protection, using three-current transformers, but only two single-pole overload relays or direct-acting trip coils, utilizing for this latter purpose what is known as the "Z" method of connection. The method of connecting up relays and current transformers for this protection and its application to either the three-phase, three-wire, or three-phase, four-wire system is described in detail. —*Electrical Review* (*England*), May 23, 1924.

Insulation of Electrical Apparatus.—A. P. M. FLEMING.—The trend of the development of insulating electrical apparatus, the more important changes that have recently been adopted and the influence of ventilation on insulation are treated.—*Electrician* (*England*), May 30, 1924.

Parallel Operation of Several Induction Regulators.—M. BUCOV.—If a substation which contains a transformer and an induction regulator becomes too small for the demand upon it, two possibilities are open for its enlargement. Either the existing units can be replaced by larger ones or an additional set of transformers and regulators can be added to the existing equipment. In the latter case, which is the one more frequently chosen, the problem comes up of operating two induction regulators in parallel. The author gives two solutions for this. The electrical parallel operation requires that the rotors of the regulators must always be kept in exactly identical positions so as to divide the load equally between each other. As their two driving motors can never be depended upon to operate always in perfect unison, the voltage relays alone are not sufficient to accomplish this. A differential watt relay has to be used in connection with each regulator, thus insuring that the load is properly divided. A complete wiring diagram illustrates the use of relays with two regulators. A second method is the mechanical coupling of two or more regulators. On account of small mechanical misalignments between a plurality of regulators a rigid coupling among them is impossible. A common solid shaft for the regulators is recommended, with gears and flexible shafts to each unit. Each unit has its own motor, which, however, has not sufficient power to turn more than its own armature. This compensates automatically any differences in the times the motors need to come up to speed. The end limit switches must be connected in series, so that all motors are stopped when the first end switch comes to the end position. A connection diagram is also given for this second solution.—*Elektrotechnische Zeitschrift*, June 26, 1924.

Transmission, Substations and Distribution

Power Transmission Lines.—II.—W. T. TAYLOR.—In this concluding section of Part II of this series examples are given for using the chart (given in last issue) for finding the line constants of any overhead line circuits. This chart should be a valuable aid in the calculation of the quantities to which it relates and is a valuable time-saver when there are a number of problems to be solved.—*Electrical Review* (*England*), June 13, 1924.

Overhead Lines with Suspension Insulators.—G. MARKT.—In frequent cases, particularly when crossing mountainous regions with towers for high-voltage lines holding the conductors with chain-type insulators, the conductors cannot always be placed equidistant. Changes in temperatures and unequal additional loads upon the cables will cause in such cases certain inclinations of the chain insulators, which are unsafe and undesirable. The author gives a simple mathematical and graphical method, by means of which towers can be located so that under a given initial tension in the cables the minimum deflection of the chains from the vertical position can be obtained readily. Two examples show the proper use of the method and on two photographs of an actual line, calculated in accordance with the author's method, showing cables descending at angles of 32 deg. and 18 deg., the perfectly straight position of the chain insulators is apparent.—*Elektrotechnische Zeitschrift*, June 12, 1924.

Cleveland Heights Substation of the Cleveland Electric Illuminating Company.—H. L. WALLAU.—An abstract of this paper may be found in the ELECTRICAL WORLD report of the A. I. E. E. annual convention, July 5, 1924, page 7.—*Journal of A. I. E. E.*, June, 1924.

Units, Measurements and Instruments

Elements of Magnetic Analysis.—E. H. CRAPPER.—A complete system of magnetic analysis as evolved and put into operation is discussed in detail. The author deals with the laws and quantitative relationship of the magnetic circuits. The magnetic constants of a magnet which require consideration may be divided into two general groups, according as they refer (1) to the nature of the material utilized and (2) to the working qualities of properties of the magneto magnet. These constants are obtained directly by experiment or derived from the experimental results obtained and are found by taking the product or quotient of two values obtained experimentally. It must be recognized, however, that there is no single constant of a permanent magnet which specifies exactly its suitability as the essential element of a magneto. Furthermore, distinction must be made between the problems associated with the design of a magneto and those dealing with the operative and working qualities of this type of electric generator, the importance of which has increased. This excellent article, covering the entire subject, is eight pages long and contains twenty-one illustrations and eleven tables.—*Engineering* (*England*), Vol. CXVII, Nos. 3041, 3045, 3047, 3051 and 3052.

Measurement of Input and Output in Boiler Rooms.—J. M. SPITZGLASS.—The author describes how to measure the input and output of boiler rooms by means of measuring the fluids, gas, water, steam and air draft. The practical application of measuring devices

to each of the various quantities to be measured is described.—*Iron and Steel Engineer*, June, 1924.

New Balancing Apparatus. — F. PUNGA.—To determine very quickly the amount and the direction of unbalance on high-speed machinery a new instrument has been developed which the author describes. It consists of two disks, revolving side by side in opposite direction and with a planetary gear drive between them, so as to cause a slight difference in their relative speed. The apparatus is available in two sizes, up to 3,000 r.p.m. and up to 6,000 r.p.m. Only a few minutes are required to accomplish a measurement. —*Elektrotechnische Zeitschrift*, July 3, 1924.

Motors and Control

High-Lift Pumping. — E. F. IRVING. —The Calumet & Arizona Mining Company of Warren, Ariz., is completing the installation of a mine-drainage plant at its Junction mine. All mine water will be brought to the 2,200-ft. level through rises and cross-cuts and pumped to the surface in one lift. The installation consists of three motor-driven pumps, two of 1,000 gal. per minute and one of 1,500 gal. per minute. A fourth pump of 1,250 gal. per minute will be added later. Each unit is driven by a synchronous motor through flexible couplings and single-reduction herringbone gears at approximately 514 r.p.m. Details of this pumping installation are discussed.—*Engineering and Mining Journal-Press*, June 28, 1924.

Electrical Equipment of the Consolidated Mining and Smelting Company's Zinc Plant at Trail, B. C.— R. N. LOCKYER.—In this paper, to be presented at the Pacific Coast Convention of the A. I. E. E. next fall, the author considers the electrical equipment operating in the above plant. This plant, at an initial cost of $2,500,000, produces zinc by the electrolytic process, which results in a pure and more homogeneous product than when zinc is produced by other methods now in use.—*Journal of A. I. E. E.*, June, 1924.

Army Engineers Build Four Seagoing Electric Dredges.—Virtually the latest design in ship propulsion and dredge operation is exemplified in the seagoing hydraulic dredges described in this article. Diesel-engine electric power generation and all-electric operation, even to the smallest service, are combined with direct control from the pilothouse of every dredge movement. They are unique products of the dredge designer and are so described.—*Engineering News-Record*, July 10, 1924.

Heat Application and Material Handling

Metallic Resistor Furnaces.—E. F. COLLINS.—In the first of these two articles the author describes the various types of resistance furnaces used and gives illustrations of their industrial application. In the second article the influence of the conditions surrounding the application of the metallic resistor type of furnace are discussed. This article should be particularly useful to industries contemplating the use of electric heating in their processes.—*Chemical and Metallurgical Engineering*, June 16 and 23, 1924.

Use of Hydro-Electric Power for Domestic and Industrial Heating.—N. FORSBLAD.—This is a general discussion, applied to conditions in Sweden, of the possibilities of a more extended use of hydro-electric power for heating purposes other than ore smelting and similar applications. The demand for electric power for heating purposes is divided into seven different groups, comprising heating of dwellings, several industrial applications and domestic cooking. The heating of dwellings offers very small possibilities in the immediate future. Industrial applications—such as ovens for enamel baking, baking ovens in industrial bakeries, etc.—are very promising in a great number of cases. Electric domestic cooking is discussed with the present prices of gas and wood fuel in view, and the conclusion is reached that, from a national economic point of view, the smaller gas generating stations could be dispensed with and their production replaced by electric power.—*Teknisk Tidskrift* (*Swedish*) *Elektroteknik*, July 5, 1924.

Electrophysics, Electrochemistry and Batteries

Thermo-Electrical and Actino-Electrical Properties of Molybdenite.—W. W. COBLENTZ.—When molybdenite is heated by thermal conduction or by the absorption of thermal radiation it exhibits hitherto undescribed thermo-electric, actino-electric and photo-electric properties. The author first gives a historical account of the transformation of thermal radiation into electric current and some historical data on the thermo-electric properties of crystals. He then describes the various properties of molybdenite.—*Scientific Paper No. 486 of the Bureau of Standards.*

Corrosion Problems.—This issue is devoted entirely to corrosion problems. Practically all of the corrosion data heretofore collected measure in terms of confusing and widely varying units either the resistance of particular metals and alloys to reagents or the converse, the action of a specific reagent on metals and alloys. More than a thousand engineers in various industries were solicited for their opinions and a statement of their practice from the standpoint of corrosion resistance. This information has been carefully sifted and interpreted in the form of twenty or more editorial summaries, focusing attention on corrosion problems in the various industries, the means adopted for their solution and the present status of problems unsolved. In addition, there are included pertinent data from two outstanding compilations by the American Society for Testing Materials and the National Research Council. The former tabulates the physical and chemical properties of seventy-five corrosion and heat-resistant alloys, while the latter reviews recorded experience in the application of the pure metals most used in chemical engineering construction. —*Chemical and Metallurgical Engineering*, July 14, 1924.

Traction

Main-Line Railway Electrification.— PHILIP DAWSON and S. PARKER SMITH. —The authors, in this three-part article, discuss the electrification of the railways in Switzerland. The specific subjects considered are (1) reasons for electrification, (2) choice of systems, (3) present state of electrification, (4) discussion of the various electrified railways in Switzerland, and (5) results of electrification. Under the choice of system, the influence of the magnitude of voltage on the trolley wire, locomotives and motor coaches, efficiency of system, energy distribution, generation and conversions and interference with communication circuits are discussed. The various enterprises considered include the Berne-Loetschberg-Simplon Railway, the Rhaetian Railway, the single-phase lines of the Swiss Federal Railways and the three-phase lines of the Swiss Federal Railways at Simplon Tunnel and between Brigue and Sitten and the Freiburg-Murten-Ins Railway. Energy consumption, electric locomotive maintenance, locomotive tests, electric braking and communication interference on the Berne-Thun Line are discussed under the subject of results of electrification. The article is eleven pages long and contains thirty illustrations and eleven tables. — *Engineer* (*England*), June 6, 13 and 20, 1924.

Trends in Electric Railway Equipment.—G. M. WOODS.—An analysis of railway equipments sold by one large manufacturer during the past ten years discloses several tendencies of general interest. Among these are smaller wheel sizes, double-end control, double trucks, four motors per car, lower weight per car and smaller-size motors. Diagrams are given showing this trend.—*Electric Railway Journal*, July 5, 1924.

Telegraphy, Telephony, Radio and Signals

Ribbon-Type Transmitter and Receiver. — E. GERLACH. — Within the long and narrow air gap of a strong permanent electromagnet is stretched out a finely corrugated ribbon of aluminum, only 0.01 mm. thick. This ribbon represents a movable conductor in a magnetic field and may therefore either produce current by being moved or it will be set in motion when current is passed through it. In the former case it acts as a transmitter, in the latter as a receiver of telephonic currents. Such an instrument can be readily built so powerful acoustically that without using a horn it exceeds in loudness the average loud speaker with a horn. In connection with a 12-ft. horn such a receiver was erected on the roof of a house and carried the human voice intelligibly over a distance of several hundred yards.—*Siemens Zeitschrift*, June, 1924.

Radio-Telephone Broadcasting Station.—D. G. LITTLE.—The three transmitting sets used at East Pittsburgh by the Westinghouse broadcasting station KDKA are described in detail, with their auxiliary apparatus.—*Proceedings of the Institute of Radio Engineers*, June, 1924.

New Books

Reviews of the Latest Contributions to
Technical, Industrial and Commercial Literature of Particular Interest
to Members of the Electrical Industry

Electrical Measuring Instruments

By C. V. Drysdale and A. C. Jolley. London: Ernest Benn, Ltd. 429 pages, 377 diagrams and illustrations. 55 shillings.

The purpose of the authors of this volume is to meet the need for a book which will be to the designer and constructor of electrical instruments what the various books on dynamo design, etc., are to the electrical engineer, and which will give the user of such instruments detailed information concerning important points of construction and performance of the numerous types of measuring instruments. The present volume deals almost entirely with direct-indicating instruments, and within these limits the purpose of the authors has apparently been accomplished in admirable fashion. Not only does the work show an intimate and thorough knowledge of the theory of all types of measuring instruments, but the various phases of the general topic are discussed in the light of measurements and examinations of a very wide variety of instruments as purchased in the open market.

Five general chapters include a survey of the general magnetic, thermal, chemical and electrostatic principles upon which indicating instruments are based; a comprehensive discussion on mechanical design and construction; the conditions governing rapid indication; a review of fundamental electrical principles of electromagnetics, electrostatics and electrolytics and of the properties of electrical and magnetic materials commonly used in measuring instruments. The review of the various influences affecting the behavior of iron and the properties of the various alloys of iron is very satisfying, although the book was evidently printed before some of the most recent important publications in this field. Following these general chapters come exhaustive chapters on permanent-magnet moving-coil instruments, soft-iron instruments, dynamometer instruments, hot-wire instruments and electrostatic instruments. In these chapters the theory and data already presented are reviewed in connection with numerous instruments manufactured during the last ten or fifteen years. As a result of this study in each of these latter chapters there is a table giving comparative values of every important property of an instrument among the various examples studied.

Published in England, the book contains studies of some fifteen or twenty different makes of instrument of the several types, all of them, however, drawn from England and the Continent with the single exception of the American Weston, which is included. The induction type of direct-indicating instrument produced by well-known American makers is not found among the types of instruments treated. Notwithstanding these omissions, the book should prove very valuable to all designers of instruments as it assembles in one volume a far wider variety of information both on materials and theory than is usually found in works in this field. To this should be added that the form of presentation of the subject matter, as regards the use of English and lucidity of expression, is admirable, as is to be expected of the well-known authors. The mechanical make-up in the matters of printing, illustration, etc., is also excellent. J. B. W.

The Technical Organization: Its Development and Administration

By J. M. Weiss and C. R. Downs. First edition. New York: McGraw-Hill Book Company, Inc. 190 pages.

This book was written to outline briefly and concisely the relations between the industrial employer and his scientific employee and methods to bring about mutual understanding and a better working relationship. A program is drawn up both to assist the organization of technical development and to procure better human relationships and mutual understanding. The book should fill a need in this age of rapid development of organizations with a large staff of technically trained men. It outlines the fundamental organization principles, methods of attack and ways of doing work that the authors consider suitable for a specialist group in an industrial organization. While quite general in character, the treatise deals with fundamental principles and does not make the mistake of advocating an ironclad system of organization or procedure.

Electrical Measuring Instruments and Supply Meters

By D. J. Bolton. New York: E. P. Dutton & Company. 314 pages, illustrated.

An in-between book in that it is not entirely theoretical or entirely practical in character. It gives the fundamental principles underlying portable, switchboard and other meters but avoids mathematics and quantitative treatment. It is a well-written, fundamental book that adequately explains the principle of operation, the limitations in use and the application of measuring instruments without giving a great amount of space to details. A good chapter on standardization and another on resistance measurements add to the scope of the work, and its completeness is indicated by its treatment of electrostatic meters, power-factor meters, galvanometers and other special types. A rather inadequate amount of space is devoted to commercial watt-hour meters, demand meters and other special commercial types commonly used in this country only, and the book will find its widest field of use in trade schools and for elementary courses in colleges.

Power Station Efficiency and Control

By John Bruce. With an appendix by R. H. Parsons. London: Sir Isaac Pitman & Sons, Ltd. 227 pages, illustrated.

This book is written from the standpoint of the English power-station engineer and describes very largely English equipment and practices. It covers boiler-room measuring instruments, boiler-room efficiency determinations, turbine-room equipment and efficiency determinations, combustion and fuels, heat-balance control, methods of recording and tabulating operating results and interpretation of Parsons lines. A very good book for the library of all power-station engineers, as it comprises many fundamental data and authoritative opinions based on power developments in England.

Book Notes

A Handbook of Telephone Circuit Diagrams with Explanations. By John M. Heath. New York: McGraw-Hill Book Company, Inc., 280 pages. Price $2.50.

This little handbook contains a large number of circuit diagrams showing various possible arrangements of the component parts in local-battery and common-battery telephone systems with brief explanations. It includes diagrams of selective ringing circuits. The drawings are in simplified form and are well arranged for use.

Chart Atlas of Complex Hyperbolic and Circular Functions. By A. E. Kennelly. Cambridge: Harvard University Press. Third edition. 32 charts, mostly 50 cm. x 50 cm. Price $6.

These charts have been drawn for enabling the user to interpolate swiftly and by direct inspection between the tabulated values of the functions appearing in the separate companion volume "Tables of Complex Hyperbolic and Circular Functions," published by the same author and press. Nine new charts have been added to the original twenty-three.

Engineering Drawing. By Thomas E. French. Third edition. New York: McGraw-Hill Book Company, Inc. 409 pages, illustrated.

This well-known book has been revised and enlarged, but the plan as originally conceived has not been changed. Many new problems have been added, as well as new matter in text and appendix. The importance of dimensioning is emphasized by a separate chapter, and a chapter on perspective has replaced the former one on that subject. The growing use of graphical charts in engineering and business is shown by the special treatment given this subject.

Trade Terms. Digest No. 43. Paris: International Chamber of Commerce. 120 pages.

Details of buying and selling and definitions of terms used in international trade.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rullings and News of Electrical Men

I. E. C. Adopts List of Standard Symbols

Advisory Committees Meet in London—Action Begun on Transformer Oils and Traction Motors—Prime Movers Committee Revitalized as Result of World Power Conference

THE principal definite accomplishment of the meeting of the International Electrotechnical Commission advisory committees in London during the week of July 14-18 was the adoption of a rather extended list of standard symbols. These symbols were first proposed in definite form, as the result of many previous discussions, at the last Geneva meeting, and that work, coupled with some subsequent definite suggestions from some of the participating nations, the committee found it possible to give approval to a long list of symbols. It will be a few weeks before this list will be prepared for publication, but, when once given wide distribution, it is expected that it will do much to effect an international language in electrical drawings. One much-discussed symbol has been that of transformer windings — should they be spirals to indicate their inductance or may they be zigzagged, a much used form in many countries, and a much easier one to use for such a common piece of apparatus? It was finally agreed that the zigzagged line would be adopted, as every one knows that transformer windings have inductance.

Three sessions of the rating committee failed to produce any final agreement on the problem of modifying the basis of rating synchronous generators of 7,500 kva. and over. That the highest observable temperature for Class B insulation should be raised received unanimous indorsement, but whether the limit should be 120, favored by the American delegation, or 125, favored by Great Britain and some others, was not decided. The United States had proposed an 80-deg. rise from a 40-deg. ambient; Great Britain had proposed a 90-deg. rise from a 35-deg. ambient. What did come out of the discussion, however, was a better agreement as to the distinction between commercial ratings and standards of test.

The committee reached a consensus of opinion that embedded detectors be the required standard in all synchronous machines whose core is 1 m. or over in length. There was also consensus of opinion that while tolerances from ratings were allowable in the cases of speed (direct-current machinery being particularly in mind in this one item) and in voltage regulation, tolerances should not be allowed in the cases of power factor and efficiency.

The usual method of procedure with the I. E. C. advisory committees is for each committee to elect a chairman for each group of meetings. The nomenclature committee departed from that custom this year, in order to secure a more continuous action and policy, and selected C. O. Mailloux of the United States as the permanent chairman. The committee took no stand at this meeting.

Transformer Oils and Traction Motors

Two new committees were started at the London meeting. These are the committee on transformer oils and the committee on traction motors. Nothing more than organization meetings occurred, but the committees expect to have definite programs under way when the next group meetings of the advisory committees, now planned for The Hague in April, 1925, are held.

The recently created "comité d'action" —consisting of the president, the honorary president, the secretary, the honorary secretary and two others specially appointed for each meeting of the committee, and for whose name no English equivalent expression has been agreed upon by the I. E. C.—took steps to revitalize the prime movers committee, organized some twelve years ago. It had developed at the World Power Conference that there was a serious demand for standardizing work in the steam and mechanical lines connected with electrical power production, and the complaint had been made that there was no international commission or committee at work on such problems. The comité d'action, following this discussion and what amounted to a request for the I. E. C. to take the responsibility or the lead in the matter, decided to revitalize the prime movers committee which had been organized for that very purpose and to have it meet at the next group meetings of the advisory committees, and to invite to sit with it any mechanical standardizing committees of the various nations or national standardizing committees or others directly interested in such standardizing work of an international nature.

Altogether there were some forty-five to fifty in attendance at the meetings. The following countries were represented: Belgium, France, Great Britain, Holland, Italy, Japan, Norway, Spain, Sweden, Switzerland, United States. Germany has never elected to resume her place as an active member and has not yet been invited to do so by the commission, though an invitation was extended to her to have an observer present. Mr. Le Maistre, who delivered the invitation in person, said he was cordially and "correctly" received in Germany, but that the Germans thought it would serve no good purpose for them to return until they could do so as active members.

The United States delegation included C. O. Mailloux, honorary president; C. H. Sharp, Clarence L. Collens, 2d; E. C. Crittenden, L. L. Elden, H. M. Hobart, A. E. Kennelly, C. E. Skinner and H. V. Bozell.

Ten per Cent Raise to Southern California

Rate Increase Granted for Eight Months from September 1 Because of Situation Caused by Drought —Will Yield $1,100,000

THE Southern California Edison Company has received authority from the Railroad Commission to make a 10 per cent increase in its rates for lighting and power service, effective September 1 for a period of eight months. All consumers with the exception of the agriculturists will be required to pay the increased charges. The commission found the increase necessary because of the additional expense to which the company will be put in producing power from steam as a result of the water shortage in southern California. In addition the company has been compelled to purchase steam power from other utilities at a rate higher than would be the cost if it produced power by water in its own plants.

The company, which asked for a 20 per cent increase, estimated to raise $3,000,000 in additional revenue, claimed that because of the abnormal conditions it would suffer a loss of about $5,600,000 in its net income. This increase, the company's representatives contended, was necessary so that the company could continue its development work. The urgent need of the community is for more power, Roy V. Reppy, the company's counsel said, but this could not be provided unless funds were forthcoming for it. The problem was, he maintained, a community problem, not the problem of the company alone.

Counsel for the California Farm Bureau Federation and counsel for the Antelope Valley farmers declared that the water table will not be replenished for almost a year after the winter's

rains fall, that it is now so low that double the customary amount of power is required for pumping, and that any increase in rates would amount to a triple burden on ranchers, who are not financially able to stand it. They declared that if any increase were granted the burden must be placed on the cities and on consumers who can pay it.

Twenty-six cities joined in opposing the increase requested, but their counsel did not make an oral argument.

The increase allowed by the commission is estimated to yield the company approximately $1,100,000.

Drought Encourages Boulder Dam Advocates

The drought in California has lent encouragement to the advocates of the Swing-Johnson bill and the Boulder Canyon Dam project. Representatives of fifty-six municipalities, associations and districts in the southern part of the state met a week or so ago at Long Beach and agreed that on the development of the Colorado River as proposed in the bill depended their assurance of an adequate water supply in years to come. The Mayor of San Diego was empowered to name a committee to convene representatives of all the cities desiring Colorado River water for domestic purposes in the expectation that these representatives will demand that Congress pass the bill in its present form and disregard alternative plans of development. The cities especially concerned include, it is stated, virtually all in Riverside, San Bernardino and Orange Counties and many in Los Angeles County, besides Los Angeles itself.

Commonwealth Edison Shareholder List Exceeds 40,000

The current quarterly dividend on Commonwealth Edison Company capital stock was mailed on August 1 to approximately 40,300 shareholders. This number represents an increase of more than 6,000 since the beginning of this year. This unusually large increase results from the stock sale just closed, from the closing of a series of the employees' savings fund and from the gradual increase due to the closing out of partial-payment accounts.

In the stock sale just closed 12,864 new accounts were opened. Of these 4,785 were for cash purchases and 8,079 were deferred-payment accounts. An interesting point in this connection is that while approximately the same number of shares were subscribed for under each plan, the cash subscriptions averaged six shares each and the deferred subscriptions three shares each.

While it is difficult to estimate the percentage of partial-payment accounts which represent new shareholders, it is likely that the company has at least 4,000 potential shareholders on its books. It is also expected that the number of employee-shareholders will show a substantial increase over previous figures. Since the inauguration of its policy of customer-ownership in 1919 the Commonwealth Edison Company has multiplied its number of shareholders six and one-half times.

Power Commission's Year

Federal Board Had Thirty-four Applications for Permits and Fifty-three for Licenses

DURING the fiscal year ended June 30 the Federal Power Commission received eighty-seven new applications for rights under the act. Of these thirty-four were for preliminary permits and fifty-three were for licenses. Of the licenses ten were for major projects. During the fiscal year nine holders of preliminary permits applied for licenses.

At the end of the fiscal year the total outstanding rights asked of the Federal Power Commission covered 21,500,000 hp., this being the total estimated installed capacity of the projects and the proposed projects. The total is practically the same as was the case at the end of the fiscal year of 1923 and 1922. In all, a total of 512 applications have been filed with the commission, but some of them have been rejected and others have expired, thereby offsetting the additions represented by new applications. During the fiscal year just ended the new applications covered projects with an estimated installed capacity of 2,500,000 hp., but the losses resulting from rejections and expirations totaled substantially that amount.

Practically one-half of the 21,500,000 hp. represented by the existing live applications cover projects on the St. Lawrence, the Colorado and the Columbia and are being held in abeyance on questions of policy. The St. Lawrence is an international stream and the plan for its full development must be worked out with Canada. No licenses are being granted on the Colorado pending the ratification of the Colorado River compact or some other agreement between the states of the basin. On the Columbia the plan for the river's development is awaiting the determination of the feasibility of the Columbia Basin project.

The expiration date of an unusually large number of preliminary permits will occur during the current fiscal year. In many instances it is anticipated that application will be made for a license, but in others it is known that the requirements of the preliminary permit are not being complied with.

Principal among the ten major projects for which licenses were issued in the past fiscal year are the Columbia Valley Power Company's project on the Deschutes River, where an installation of 185,000 hp. is to be made; the Upper Tallapoosa, where 114,000 hp. will be installed; the Pike Rapids Power Company, on the upper Mississippi, 24,000 hp., and the Thomas Bay project in Alaska, 29,000 hp.

California Electric Utilities Triple Oil Consumption

"Electric utilities in California will use 10,000,000 barrels of oil during 1924 owing to dry-year conditions, as against 3,000,000 barrels in 1923," declared Harley W. Brundige, a member of the California Railroad Commission, recently in addressing the Chamber of Mines and Oil. "The increase in the use of oil due to present conditions thus represents approximately 7,000,000 barrels in excess of that which would be required in a normal year. In addition to this the utilities are using natural gas equivalent to more than 1,000,000 barrels of oil.

"For the year 1924 the oil bill of the gas and electric utilities will be approximately $20,000,000. The fuel bill for the electric utilities of California in 1924, owing to increase in the price of oil and increased use due to dry-year conditions, will be approximately $10,000,000 greater than in 1923."

California Stream Flow Lowest on Record

The California Railroad Commission has compiled figures for Power Supervisor Butler which show that the run-off on the rivers of the state is the smallest since stream-flow records have been systematically kept. The Sacramento River on June 30 showed a discharge of 2,900 sec.-ft. at Red Bluff, Cal., compared with 3,740 sec.-ft. on the same date in 1920, the last drought year. The lowest previous record was 3,150 sec.-ft. The flow was reported as still decreasing. The Mokelumne River at Clement showed 15 sec.-ft. against 500 and the San Joaquin River 100 sec.-ft. against 1,960, comparing the same dates. The Kings River fell to a maximum of 3,930 sec.-ft. in May against a normal discharge of 10,000 sec.-ft. It has been necessary to withhold irrigation from 400,000 acres in Kings River Valley.

The commission reports the water systems supplying San Joaquin Valley to be generally dependent upon wells and that, except for lowering of the water plane beyond expectations or limitation of electrical power for pumping, they will be able to meet normal demands.

Against these straitened conditions, the Pacific Gas & Electric Company's engineers assert the sufficiency of the Pit and Fall Rivers supply in northern California, important sources of San Francisco power. These rivers drain vast areas of porous volcanic watersheds. The Great Western Power also fares reasonably well at its Feather River storage lakes.

Horseshoe Lake Plant of Oklahoma Gas & Electric Starts

On Thursday, July 31, the new electric generating station built by the Oklahoma Gas & Electric Company at Horseshoe Lake, 23 miles east of Oklahoma City and near the town of Harrah, began delivering current into the 1,200 miles of high-voltage transmission system of the company and added the electrical output of 20,000-hp. engines to the energy available for domestic and industrial uses on the system of the company and connected lines owned by other companies and municipalities.

Following by a few months the "cut-in" of the Riverbank plant near Muskogee, owned by the Oklahoma General Power Company, a subsidiary of the Oklahoma Gas & Electric Company, with 30,000 hp., the beginning of operations at Harrah completes a construction program of $10,500,000, undertaken

by the last-named company in Oklahoma, practically all of which has been expended since January 1, 1923.

The Horseshoe Lake plant was built in a little more than a year. The site was chosen because it supplied cool water for the turbines and was in favorable proximity to the Rock Island coal fields. The company owns approximately 1,000 acres of land there, which it will convert into a park and camping ground. With the completion of this plant the plant on Noble Street in Oklahoma City will be kept as a standby station.

The Oklahoma Gas & Electric Company now supplies eighty-two cities and towns in Oklahoma and Arkansas with electric light and power. With the additional generating capacity supplied by the Horseshoe Lake plant the full twenty-four-hour demand of all these cities and towns is amply provided for and the company is equipped to keep pace with the substantial growth anticipated throughout its service area.

Large Attendance Expected at Camp Co-operation IV

Present indications are that Camp Co-operation IV, as the annual conference of local electrical leagues and clubs is known, will be one of the best-attended meetings ever held at Association Island, Henderson Harbor, N. Y. More than 160 reservations, representing more leagues and others interested in building business locally by co-operative methods than have attended any previous conference, have already been made. Additional reservations are coming in daily. The conference, the organization details of which are being handled by the Society for Electrical Development, will be held from September 2 to 6 inclusive. The gathering will, however, open informally on September 1 with a flag raising and an address by W. L. Goodwin.

The topics to be reported on and discussed will include:

TUESDAY, SEPTEMBER 2

Evening.—"League Service Outside of the Industry, Including Contact with Building Permit Holders Architects, Builders and Realtors"; "League Service to Contractors and Dealers."

WEDNESDAY, SEPTEMBER 3

Morning.—"The Red Seal—Its Uses and Advantages."

Evening.—"League Methods to Promote the Use of Industrial Equipment"; ten-minute (maximum) discussions of nine practical points connected with league work.

THURSDAY, SEPTEMBER 4

Morning.—Report of league committee and presentation of articles of confederation for electrical leagues, by Earl E. Whitehorne; "The Value of the Electric Home as a Medium for Reaching the Public"; "How to Secure Publicity by Co-operative Effort."

Evening.—"How to Interest Women in Electrical Equipment for the Home"; "Store-Lighting Campaigns"; "Co-operative Advertising Only as a Background for Individual Effort."

FRIDAY, SEPTEMBER 5

Morning.—"Home-Lighting Contest."

Afternoon.—"Selling Electrical Merchandise Through Community Shows"; "Keeping the Members Sold."

Friday afternoon may be devoted to continuation of the discussion on the home-lighting contest instead of to the topics indicated above. On Friday evening there will be a banquet. Saturday morning is held open.

Investment Bankers' Views

Public Service Securities Committee Studies Utility Regulation—Against Great Falls Bill

IN A REPORT presented to the board of governors of the Investment Bankers' Association very recently the public service securities committee of that body told of an extensive study which it has started this year into state laws governing the regulation of public utilities. It finds the laws of many of the states very inadequate as to provisions for broad and sound regulation and also that in some cases laws really antiquated remain on the statute books. Material revision, the committee holds, is necessary, especially in making adequate provision for sound financial structures of companies engaged in constructive expansion. The committee hopes in its coming annual report to discuss the laws of certain states in detail with appropriate recommendations to the district groups for action in 1925 when state legislatures are in session.

Another matter taken up by the committee is the bill now before Congress to bring about federal development on the Great Falls of the Potomac. Reiterating the opposition of the Investment Bankers' Association to government projects of this kind, involving great expense and often loss to the taxpayers, destroying values in privately owned properties through actual or threatened competition with them, and thus discouraging further private investment, the committee has appointed a sub-committee from among its members to watch the course of the bill and to solicit aid in combating it from members of district groups when such aid is needed. Orlando B. Willcox, former chairman of the committee, presented the views of the association at the public hearings on the bill held last spring.

New England Power May Buy Webster & Southbridge

The New England Power Company offered at a hearing last week before the Selectmen of Webster, Mass., to purchase a controlling interest in the Webster & Southbridge Gas & Electric Company to end a controversy over the New England company's contract to supply energy to the Slater Mills, the town's largest industry. The Selectmen have been petitioned to grant certain road-crossing locations to the New England company. The Slater Mills have installed high-voltage transformers and new motors, and they claim that they cannot operate satisfactorily without New England Power service.

The New England Power Company, which has the permission of the Department of Public Utilities to furnish power to the mills, has held out the inducement of a general reduction in rates if its proposals for purchase of the Webster-Southbridge company are accepted. The Webster-Southbridge company, on the other hand, which is fighting the merger proposal, maintains that if it is deprived of the revenue from the Slater Mills, it will be forced to increase its rates to its remaining customers. The matter went over until the next meeting of the Selectmen.

Puget Sound Company Will Push Baker River Project

The approval of the board of directors of the Puget Sound Power & Light Company has been given to the Baker River project near Concrete, Wash., designed to develop 60,000 hp. at an estimated cost of $9,000,000, and an appropriation of sufficient funds to build the first unit has been made. Future development on this project is expected to bring the total power output to about 100,000 hp., with a total estimated cost of $12,000,000. Work will be rushed to completion. At the same time the company is speeding construction on a new unit for the White River project, which will have a capacity of 23,000 hp., costing $1,000,000. The White River plant will be completed by November of this year and the Baker River plant by November of next year. Preliminary work on the Baker River project is about completed.

Much Enthusiasm Over Home-Lighting Campaign

More than five hundred communities in twelve states have signified their intention of holding home-lighting contests this fall, according to reports received in answer to a telegraphic request from J. E. Davidson to regional directors of the national movement. These reports are from all parts of the country and indicate that the regional directors are putting much time and energy into the campaign.

In the East Louis Gibbs of Boston, Arthur Williams of New York City, W. E. Robertson of Buffalo, R. R. Young of Newark and H. A. Brooks of Washington all have carefully laid plans which are in various stages of development. W. H. Wade in Altoona, Pa., will soon have his campaign going.

Much activity is in evidence in the Middle West. J. E. North of Cleveland is making rapid trips around his division and leaving no stone unturned. John F. Gilchrist of Chicago reports that virtually all the holding companies operating in his district will cover the towns and cities in which they serve. M. E. Skinner of Pittsburgh has a well-planned committee to cover his sections intensively. Glen Walker of Omaha, Mr. Davidson's own territory, sends an encouraging report.

In the South Charles A. Collier of Atlanta and Charles W. Davis of Dallas are both working along state lines and have their districts well in hand. They have to work among a scattered population, but none the less expect great results and are highly enthusiastic. Clare G. Stannard of Denver, H. E. Young of Minneapolis and A. C. McMicken of Portland, Ore., also have special problems and are taking special means to overcome them. R. E. Fisher of San Francisco is making extensive plans that will probably be handled by the California Co-operative Campaign. Canada is also in the picture, and with F. W. Wilcox as director, great things are expected.

Mission to Mexico

Invitation from Mayor of Mexico City Accepted by American Manufacturers' Export Association

ON THE invitation of Marcos F. Raya, Mayor of Mexico City, and with the sanction of the State Department at Washington, William Wallace Nichols, president of the American Manufacturers' Export Association, is promoting an American industrial mission to visit Mexico in September, in which some of the largest industrial companies in the United States as well as bankers with commercial interests in Mexico will be represented by prominent officials. E. M. Herr, president of the Westinghouse Electric & Manufacturing Company, has accepted the chairmanship of the organization committee; Frank D. Waterman, president of the L. E. Waterman Company, is vice-chairman, and other members include M. A. Oudin, vice-president International General Electric Company; E. W. Droosten, export manager Robbins & Myers Company; N. J. Goulds, president Goulds Manufacturing Company; C. P. Coleman, president Worthington Pump & Machinery Corporation; Edward Prizer, chairman Vacuum Oil Company; James A. Farrell, president United States Steel Corporation, and S. M. Vauclain, president Baldwin Locomotive Works.

The mission may be limited to about a hundred members. It is expected to leave New York by special train on September 8. The Mayor of Mexico City and high officials of the Mexican government will meet the mission at Laredo, Tex., on the border, probably on September 11, with another finely appointed special train, and from then on the visiting Americans are to be the guests of the Mexican government and the city of Mexico. They should arrive in the capital September 13.

The complete program has not yet been received from Mayor Raya. It will include conferences with commercial and banking organizations of the Mexican capital and a formal dinner with President Obregon as host. Abundant hospitality besides will be showered on the visitors. The return journey will probably begin September 16, and New York will be reached five days later.

Responses so far received from the invitations to join the mission indicate a very pronounced desire on the part of the manufacturing, banking and exporting interests of this country to establish close industrial relations with Mexico. The Department of Commerce has fully approved the visit and may have one or more high officials on the mission.

In his invitation Mayor Raya, who represents the business and banking interests of Mexico City, expressed the hope that those who go to Mexico on the mission will find very unusual opportunities for an interchange of commerce. With his country now settled down to a long run of industrial prosperity, Mayor Raya expressed the belief that American manufacturers will occupy a preferred status with Mexican purchasers and that a very large amount of business, profitable for both nations, will result from the visit of the mission.

Speaking of the coming visit the other day, Mr. Nichols said:

"As the time is now very short, it is desirable that those who wish to join this mission of friendship and good will to Mexico should let me know as soon as possible. Only the responsible heads of responsible American business or banking houses will be accepted. This is not a pilgrimage to sell goods, nor is it a sightseeing excursion. We desire to show our Mexican neighbors that we can be of real aid to them in their business affairs and that they can be of just as much aid to us. We want to be friends first. If business relations are to be strenghtened, as have diplomatic relations, that will follow in due course."

Inter-American Electrical Communication Conference

No vital problem connected with electrical communication was settled at the international conference held at Mexico City last month, and when the conference adjourned on July 21 it was with the representatives of the United States unable to sign the convention approved by the other delegates. The refusal to sign was necessitated by the inclusion of a provision that rates be established by an international agreement. This provision was an outcome of the fact that the land electric communication systems in Latin-American countries are almost without exception owned and controlled by the government. The United States delegates could not, of course, extend to the privately owned and operated cable systems of this country rates thus arrived at or subject these systems to international control.

Other provisions in the final draft of the convention were that direction and control of communication in each country must be placed in the hands of a single directing body and that the land lines of adjoining nations should be connected at the earliest opportunity. Minor provisions covered official broadcasting, service protection to navigation, censorship, use of codes, settlement of disputes and other matters of routine importance.

Mexico and Brazil were well represented at the conference, as was the United States. The other countries in the Pan-American Union depended chiefly on their diplomatic representatives in the Mexican capital.

World Power Conference Banquet at Queen's Hall, London

Union of Colorado's Two Chief Companies Likely

The merger foreshadowed some time ago between the Public Service Company of Colorado and the Colorado Power Company will be submitted on September 3 to the stockholders of both companies. With its completion the combined company will have nine steam and four hydro-electric plants, capable of furnishing a joint total of 107,000 hp., and will serve a territory with an estimated population of 425,000.

The Public Service Company was formed last year by a merger of the Denver Gas & Electric Light Company and the Western Light & Power Company. With two steam electric plants in Denver, one near Lafayette, Col., and one in Cheyenne, Wyo., the company supplies gas, electricity and heat to Denver and Cheyenne and electric light and power to practically all of northern Colorado. The first unit of its new Valmont plant, near Boulder, which will furnish 27,000 hp., will be completed next year. An ultimate development of ten times as much is said to be contemplated at this plant.

The Colorado Power Company, which operates the two largest hydro-electric plants in the state, one near Glenwood Springs and the other near Boulder, supplies electric light and power in the mining regions west of Denver and in other parts of the state. Its physical assets approximate $18,000,000, and it operates several small hydro-electric plants as well as several steam plants in different parts of the state.

Says that England Lags in Electrical Development

An interesting comment on electrical development in England was made by William H. Easton of the Westinghouse Electric & Manufacturing Company on his return a few days ago from the World Power Conference.

"Leaders of British thought," he said, "have come to the conclusion that they have found the answer to the question, 'What is the matter with England?' It is because she has lagged behind other countries, especially the United States, in electrical development. Her essential problem as stated by her experts is how to increase wages and thus bring about a swifter circulation of money and an increase in the volume of internal trade without at the same time increasing the cost of manufactured commodities.

"The conclusion reached is that Great Britain must progress in the direction of harnessing the resources of science for the service of man. This conclusion is set forth in the report of what is known as 'Lloyd George's coal and power committee,' which recommends a reorganization of the British coal-mining industry, the basis of power in Great Britain, along lines that will permit private initiative to have its best effect, and also the establishment of a national system of electrical generation and distribution with the aid of private enterprise.

"'Today we find ourselves in the early stages of a second industrial revolution,' says the report, 'which, like its predecessor, consists in the application of a new form of power—electricity—and of new and more elastic methods of communication. The second industrial revolution can give us a clean instead of a dirty civilization and can render possible a healthier distribution of our people over the face of the country. Whether we make the right use of this heaven-sent opportunity for redeeming the mistakes of the past depends on whether we use wise methods of regulation and control without sacrificing the driving power of private enterprise.'"

Fifty-four Communities Added to Northern States System

H. M. Byllesby & Company have announced the purchase from the A. G. Whitney interests of St. Cloud of the St. Cloud Public Service Company and subsidiary companies, which operate electric light and power, gas and street-railway properties in St. Cloud and supply electric power and light service for fifty-three other communities in central Minnesota. It is planned to operate these properties, which were formerly managed by the William A. Baehr organization, as a division of the Northern States Power Company's central-station system.

TERRITORY SERVED BY ST. CLOUD (MINN.) PUBLIC SERVICE COMPANY

The territory served by the St. Cloud system embraces a rich agricultural and dairying section contiguous to that already served by Northern States Power Company and is in the heart of the Minnesota quarrying district. Combined population of the territory is estimated at more than 55,000. Practically all quarries in the territory are operated by electric power supplied by the St. Cloud system.

The total installed electric generating capacity is approximately 10,000 hp., including 3,000 hp. of hydro-electric capacity on the Mississippi River at St. Cloud. There are about 423 miles of transmission lines. The St. Cloud Public Service Company also owns or controls valuable undeveloped water-power sites, which are included in the purchase.

With the addition of the St. Cloud properties, the Northern States Power system will supply service to 580 cities and towns, having a total estimated population of 1,372,000, in the central Northwest.

Six Wisconsin Operating Properties Are Merged

The Northwest Utilities Company has announced the completion of an important merger of several of its operating companies in Wisconsin, the consolidated company being the Wisconsin Power & Light Company. The companies included in the consolidation are the Wisconsin Power & Light Company (formerly the Eastern Wisconsin Electric Company), the Wisconsin Power, Light & Heat Company, the Janesville Electric Company, the Mineral Point Public Service Company, the Badger Electric Service Company and the Middle Wisconsin Power Company. In addition, the Wisconsin Power & Light Company will operate the properties of the Wisconsin Utilities Company. The plan has been approved and authorized by the Railroad Commission of Wisconsin.

The consolidated company, the Wisconsin Power & Light Company, owns and operates twelve central electric generating stations, of which seven are steam and five are hydro-electric. There are approximately 745 miles of high-voltage transmission lines interconnecting the various districts served with the central power stations. The territory served, either directly or indirectly, comprises 151 communities situated in seventeen counties, most of which are in central eastern Wisconsin.

Pennsylvania Electric Association Arranges Program

The tentative program for the seventeenth annual convention of the Pennsylvania Electric Association, to be held at Bedford Springs, Pa., Sept. 3 to 6, has been prepared and will be, President Shearer announces, exceptionally interesting and valuable. It is as follows, the opening day being devoted to registration, with a reception in the evening:

THURSDAY, SEPTEMBER 4

Morning.—Reports of program, entertainment, manufactures and accident prevention committees; address, Charles B. Scott; paper, "Safety Devices," H. B. Vincent; Public Relations Section: Reports of committees on employees' relations with public, public speaking, women's public information and company employee organization; address, H. M. Addinsell; address, J. S. S. Richardson.

Afternoon.—Technical Section: Reports of electrical apparatus, hydraulic power, inductive co-ordination, meter, overhead systems, prime movers and underground systems committees.

Evening.—Public policy meeting; addresses by W. D. B. Ainey, chairman Public Service Commission of Pennsylvania, and others.

FRIDAY, SEPTEMBER 5

Morning.—General Session: Reports of committees on geographic sections, constitution and bylaws, membership and insurance; address, J. E. Davidson, N. E. L. A.; Accounting Section: Committee reports on budget, classification and application of accounts, customers' records and billing methods, fixed capital records, purchasing and storeroom records and accounts payable; address, J. Lord Rigby.

Afternoon.—Commercial Section: Reports of Lighting Sales Bureau, Power Sales Bureau, Merchandise Sales Bureau, committees on commercial service and relations with consumers, electric vehicles, salesman's handbook, finance, advertising and publicity, education and rural lines.

SATURDAY, SEPTEMBER 6

Morning.—General Session: Report of public policy committee; election of officers.

Financial and Corporate

Market Not So Brisk

American Power & Light Common Proves an Exception, This Stock Rising to Around 300

ACTIVITY in the markets for public utility stocks about reached the lowest ebb so far for the summer as August came in, a circumstance perfectly natural in view of the seasonal conditions in the industry. The surprising thing is that trading continued so active during the summer and that prices, even in the present period, are maintaining their positions so well. For several weeks changes have been unimportant, but a majority of stocks have been able, despite their previous sensational gains, to hold their ground against occasional speculative selling. Most issues heretofore have tended upward, indeed, but last week the small losses about equaled the gains.

While the market in general was dull, the outstanding feature was the buying of American Power & Light Company's common stock. In the same week that General Electric Company's stock reached a new high at 281 American Power & Light common shares pressed forward to new high levels around 300. American Power & Light is one of the most profitable holding companies affiliated with the Electric Bond & Share Company, which is, of course, a subsidiary of the General Electric Company. The rise in American Power & Light happens to have come simultaneously with that in General Electric, but there is no necessary connection. American Power & Light has a record that is almost unique as an earner, and, according to reports which many investors take as buying arguments, the common shares are likely one of these days to be split up. In reaching 300 the stock adds just 100 points to its low for this year at 200.

Among the issues that lost during the week may be mentioned: Adirondack Power & Light, which declined 2¼ points; American Gas & Electric, 2; American Light & Traction, 6; Appalachian Power, 1; Arizona Power, 1; Central States Electric, 3; Commonwealth Power, 1; Georgia Light, Power & Railways, 3, and Lehigh Securities, 1. These losses were not, apparently, provoked by anything in the nature of new developments, but rather by profit taking. Georgia Light, Power & Railways, for example, had moved from 9 earlier in the year to 36, an appreciation in value during the course of a few months of 300 per cent. The stock is, incidentally, reported to be held in substantial blocks overseas, and a relatively small amount of buying or selling here will change the quotations materially.

Not all of the net changes for the week represented losses. Aside from American Power & Light, several issues improved. Cities Service common shares closed the week seven points better off than they began it. Small rallies were made by Consolidated Gas preferred, Galveston-Houston Electric, Republic Railway & Light and American & Foreign Power Company issues.

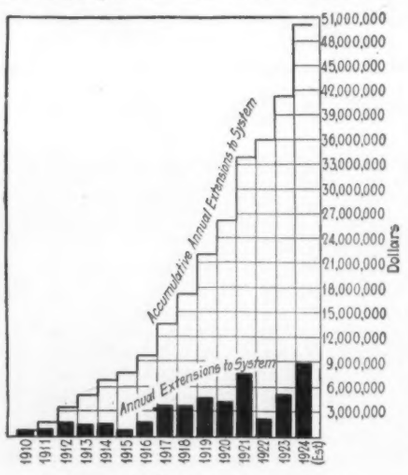
American Water Works & Electric Not Absorbed

Referring to the report in one of the New York morning papers last week that the Electric Bond & Share Company had bought control of the American Water Works & Electric Company, S. Z. Mitchell, president of the first-named company, stated that neither his company nor any of the companies with which he is connected had any interest direct, remote or contingent in the American Water Works & Electric Company and that none of them had ever even considered such purchase. Henry H. Pierce, general counsel for the American Water Works & Electric Company, also denied that there had been any change affecting the ownership or control of that company.

"A House in Order"

Refunding of Short-Term Obligations Puts Baltimore Company on Excellent Basis

STUDIED, singly and collectively, from the viewpoints of its public relations, of its financial structure, of its operations, of the physical condition of its properties and of its rate structure, the affairs of the Consolidated Gas, Electric Light & Power Company of Baltimore reveal a house in order.



GROWTH OF BALTIMORE SYSTEM IN FOURTEEN YEARS

During the war period the Consolidated company was confronted with the need for large additions to its properties and found the usual channels for the marketing of new securities preempted by government financing. The company therefore raised the new capital for plant additions by the only form of financing available, the sale of short-term notes. With the resumption of conditions approaching stability the company at once set to work to put its house in permanent order. Since that time refunding operations have been successfully carried on, resulting in the redemption of more than $20,000,000 of short-term notes through the proceeds from the sale of bonds and stock. The result of the company's refunding has been to reduce its fixed charges proportionately, as well as to give a greater degree of stability to its financial structure and to simplify it.

In bringing about this desirable result the company has succeeded in increasing the equity of its stockholders to such an extent that today the ratio of bonds to stock is 66 to 34. In 1919, following the close of the war, the outstanding bonds and term notes of the company were slightly more than 76 per cent of its capitalization.

In 1921 the stockholders of the company amended its charter to provide for issuance of preferred and additional common stock, and since that time the company has provided a substantial part of the money required for plant additions through the sale of stock at par and over.

From 1919 to June 30, 1924, the amount of securities of the company outstanding increased from $68,560,232 to $88,083,100, an increase of $19,522,868. However, the increase in the company's bonded debt during these years was $5,609,567, and the increase in the investment in the property through the sale of stock was $13,913,300. As a result of an appraisal of the company's property in 1923, the Public Service Commission of Maryland rendered an opinion that the value of the company's property was at least equal to the par value of all its securities issued. These total security issues amounted to $3.78 per dollar of gross revenue for 1923. The surplus earnings for the year 1923 were $3,047,843, which was equivalent to 17.5 per cent on the common stock outstanding. This, added to the 8 per cent dividend paid, showed earnings on the common stock of 25.5 per cent.

North American Offers Stock on Deferred-Payment Plan

Last week the North American Company offered to its stockholders at par $10,000,000 of 6 per cent cumulative preferred stock on a deferred-payment plan. According to President Frank L. Dame, the purposes of the plan are threefold—(1) to provide additional capital for the requirements of the company and its rapidly growing subsidiaries, (2) to afford the stockholders a means of purchasing on deferred payments a high-grade security producing a good yield, (3) to give the stockholders the full benefit of the present low money rates by procuring for them a 4 per cent interest rate per annum on their deferred payments and crediting them with all dividends paid at 6 per cent since July 1, 1924, to and including the date of their final payments. The North American Company had outstanding previous to this issue $19,085,750 of its $60,000,000 authorized preferred.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par value of stocks is $100.)

Companies	Bid Price Saturday, Aug 2	Low 1924	High 1924
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	95½	94	97¾
Appalachian Power, 7 per cent	86	85½	90
Arkansas Light & Power 7 per cent	90	81	93
Asheville Power & Light 7 per cent	96	96	99
Carolina Power & Light 7 per cent	97	95½	100
Central Illinois Public Service 6 per cent	84	84	87
Colorado Power 7 per cent	87	90	97
Connecticut Light & Power 7 per cent	99	99	102
Consumers' Power 6 per cent	89	85	93
Dayton Power & Light 6 per cent	83	84	90
Duquesne Light 7 per cent	105	103½	107½
Eastern Texas Electric 6 per cent	95	81	95
Empire District Electric 6 per cent	73	70	78
Fort Worth Power & Light 7 per cent	97	97	100
Great Western Power 7 per cent	97	96	98
Illinois Northern Utilities 6 per cent	82	82	87
Illinois Power & Light 7 per cent	93	88	96½
Kansas Gas & Electric 7 per cent	93	92	97
Long Island Light 7 per cent	98	95	98
Minnesota Power & Light 6 per cent	80	78	87
Mississippi River Power 6 per cent	87	80	88½
Nebraska Power 7 per cent	96	89	99
Niagara Falls Power 7 per cent—25	a 28¾	27	28½
Niagara, Lockport & Ont. Power 7 per cent	101	99¼	104½
Northern States Power 7 per cent	94½	91	97
Ohio Public Service 7 per cent	91	86	94
Pacific Gas & Electric 6 per cent	91	85½	92½
Penn-Ohio Power & Light 7 per cent	91	84	96½
Pennsylvania Power & Light 7 per cent—no par	98½	93	99
Penn. Public Service 7 per cent	90	90	100
Southern California Edison 8 per cent	115	112	119
Tennessee Electric Power, 6 per cent	76½	71	79½
Texas Power & Light 7 per cent	95½	95	96½
‡Philadelphia Electric 8 per cent—25	a 35½	29	36½
Utah Power & Light 7 per cent	96	94	96½
Western States Gas & Electric 7 per cent	78	78	85
Yadkin River Power, 7 per cent	96	94	96½
Holding Companies			
American Gas & Electric 6 per cent—50	46	41½	46
American Light & Traction	91	91	94½
American Power & Light 6 per cent	90	84	91
American Public Service 7 per cent	84	84	88
American Public Utilities 7 per cent	77	73	85
American Water Works & Electric 7 per cent	a 90½	66	99
Carolina Power & Light	98½	95½	99
Central Indiana Power 7 per cent	85	80	90
Cities Service 6 per cent	72½	67	73½
Consolidated Gas 6 per cent—50	58	51	59
Continental Gas & Electric 7 per cent	85	69	90
Electric Bond & Share 6 per cent	100	96½	103
General Gas & Electric 8 per cent—no par	101	96	101½
Middle West Utilities 6 per cent	86	80	89
National Power & Light 7 per cent—no par	90½	84	96½
North American 6 per cent—50	a 49½	43¾	50¼
Philadelphia Company 6 per cent—50	45¼	42¼	45¼
Public Service Corp. of N. J. 7 per cent	97½	96½	100
Public Service Corp. of N. J. 8 per cent	107	99¼	108½
Standard Gas & Electric 8 per cent—50	49	46½	49½
‡United Gas Improvement—50	57	55¼	58
United Light & Power 6½ per cent—no par	77½	75¾	80
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	32½	22½	34
Appalachian Power—no par	73	66½	93
Arkansas Light & Power	47	22	50
Brooklyn Edison	a 115½	107½	116
Buffalo General Electric	145	118	150
Carolina Power & Light	140	82½	150
Colorado Power	33	21	35
Commonwealth Edison	126	126	135
§Consolidated Gas, Electric Light & Power	a 114	113	117
Dayton Power & Light	115	70	120
Detroit Edison	a 108¾	102½	108¾
|| Edison Electric Illuminating of Boston	a 183¾	163½	183¾
‡Erie Lighting	28½	23½	30
*Kentucky Hydro-Electric	87½	85¾	87½
Long Island Lighting	185	100	185
Mississippi River Power	30	18½	31
Montana Power	a 68½	61½	71
Niagara Falls Power—no par	42	45	48
Niagara, Lockport & Ontario Power—100	53	45	59
Northern Ohio Electric—no par	11½	5	16
Northern States Power	99	92	106
North Texas Electric	61	58	84
Pacific Gas & Electric	a 94½	90½	95¾
‡Penn Central Light & Power—no par	59½	57	60
Pennsylvania Water & Power	107	98½	110
‡Philadelphia Electric—25	a 36	29	37½
Public Service Co. of Northern Illinois	97	97	104
Puget Sound Power & Light	60	43½	61½
Southern California Edison	98	95	106
Tampa Electric	155	134	160
Tennessee Electric Power—no par	39	20	40½
Virginia Power	47	16	60
Virginia Railway & Power	a 62¾	36	72¾
West Penn, Co.	a 87½	47½	98

Companies	Bid Price Saturday, Aug. 2	Low 1924	High 1924
Holding Companies			
‡American Electric Power—50	62	22½	62½
American Gas & Electric—no par	75½	43½	78½
American Light & Traction	128	115	140½
American Power & Light	296½	220	296½
American Public Utilities	76	35	80
American Water Works & Electric	a110½	40	117½
Carolina Power & Light—no par	141	103	146
Cities Service	136½	140	155
Columbia Gas & Electric—no par	a 40½	33	42¾
Commonwealth Power Corp.—no par	94½	56	98
Consolidated Gas—no par	a 71¾	60¼	72½
Continental Gas & Electric	58	49	62
Federal Light and Traction	79	70	83
General Gas & Electric	51½	22	55
Lehigh Power Securities—no par	78½	31	81½
Middle West Utilities—no par	57	41	60
National Power & Light—no par	132½	60	140
Philadelphia Co.—50	a 50¾	42¾	53½
Power Securities—no par	10	4	14
Public Service Corp. of N. J.—no par	a 57¾	32	58
Standard Gas & Electric—50	a 36½	31½	37¾
United Gas & Electric (Conn.)—no par	34½	14	42
Utah Securities	a 29	16½	31½
BONDS			
Operating Companies			
Adirondack Power & Light	6s 1950	102½	97½ 102½
Alabama Power	5s 1946	95	90½ 96
Appalachian Power	5s 1941	94½	89 94½
Brooklyn Edison	5s 1949	a100½	97½ 102½
	6s 1930	104½	102½ 106
	7s 1930	106½	105½ 109
	7s 1940	107	107 110
Central Indiana Power	6s 1947	93	88 95
Commonwealth Edison	5s 1943	99½	95 100
	5s 1953	a 98½	92 99½
§Consol. Gas, Elec. Lt. & Pwr.	4½s 1935	a 95½	91½ 95½
	6s 1949	a104½	101½ 105
	6½s 1951	a108½	107 108½
Consumers' Power	5s 1936	98½	94½ 99½
Duquesne Light	6s 1949	a105½	103½ 106½
Great Western Power	5s 1946	94	90½ 96
Kansas City Power & Light	5s 1952	a 95¾	89 95¾
Mississippi River Power	5s 1951	96	92 96½
New England Power	5s 1951	98½	97 100
Northern States Power	5s 1941	a 94	89½ 94
	6s 1941	a103½	96½ 103½
Pennsylvania Water & Power	5s 1940	99	96 99½
‡Philadelphia Electric	5s 1966	a 105½	97 105½
	5½s 1947	a 103½	99½ 103½
	5½s 1953	103¾	98½ 103½
	6s 1941	a106½	103½ 106½
Southern California Edison	5s 1939	98½	96 99
	6s 1944	102½	100 102½
Cleveland Electric Illuminating	5s 1939	99½	98½ 100½
Detroit Edison	5s 1933	a101	99½ 101
	5s 1940	a99½	95 101
	6s 1940	a106	104 106½
Montana Power	5s 1943	a 98	95 98
New York Edison	6½s 1941	a112½	109½ 112½
Niagara Falls Power	6s 1950	105	104 105½
Ohio Power	7s 1951	106	103 106½
Texas Power & Light	5s 1937	94½	91½ 94½
Utah Power & Light	5s 1944	a 92½	87½ 93½
Holding Companies			
Alabama Traction, Light & Power	5s 1962	77	65½ 78
American Gas & Electric	6s 2014	95½	94 95½
American Power & Light	6s 2016	93½	91 94½
Amer. Water Works & Electric	5s 1934	93	84½ 94
Commonwealth Power	6s 1948	a 95½	87 95½
Consolidated Cities Lt., Pwr. & Tr.	5s 1962	72	64 73
Illinois Power & Light	6s 1953	99½	95 100½
United Light & Railways	5s 1932	92	87½ 92
	6s 1952	96	92 96
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing	a97½	90	98
*National Carbon	122	115	125
†Wagner Electric	81	77	84
COMMON STOCKS			
Allis-Chalmers Manufacturing	a 55	41½	58½
American Bosch Magneto—no par	a 28¾	22½	38¾
Electric Storage Battery—no par	a 58	50½	64
General Electric	a 277	193½	281
General Electric—10	a 11½	10½	11½
*Hurley Machine—no par	a 58½	48	59½
Manhattan Electric Supply—no par	a 45¾	33½	49½
*Vesta Battery—no par	15	15	28
†Wagner Electric	a23½	23½	34½
Westinghouse Electric & Manufacturing—50	a 64¾	55½	65
Worthington Pump & Machinery	a 27	23½	31½
BONDS			
Canada General Electric	6s 1942	106½	102½ 106½
General Electric	3½s 1942	83	80 83
	5s 1952	a 103½	100 103½
Robbins & Myers	7s 1952	77	75½ 91½
†Wagner Electric Manufacturing	7s	100	97 100
Western Electric	5s 1944	a 98¾	96 98¾
Westinghouse Electric & Mfg.	7s 1931	a 108¾	106½ 108¾

*Chicago Stock Exchange. †St. Louis Stock Exchange. ‡Philadelphia Stock Exchange. || Boston Stock Exchange. §Baltimore Stock Exchange.
a Bid price Wednesday, Aug. 6.

Dividends Declared

The following quarterly dividends were announced by central-station companies and electrical manufacturing companies during the seven-day period ended August 5:

Name of Company	Per Cent	When Payable
American Electric Power, pf.	1¾	Aug. 15
Charlestown Gas & Electric	$2.50	Aug. 1
Cities Service, pf and pf B	½	Sept. 1
Cities Service, com*	½	Sept. 1
Cities Service, com†	1½	Sept. 1
Consolidated Gas	$1.25	Sept. 15
Georgia Railway & Electric	2	Aug. 20
Georgia Railway & Power, com.	1	Sept. 1
Georgia Railway & Power, 1st pf.	2	Oct. 2
Georgia Railway & Power, 2d pf.	1	Sept. 1
Northern Ohio Traction & Light, pf, 6 per cent	1½	Oct. 1
Northern Ohio Traction & Light, pf, 7 per cent	1¾	Oct. 1
Penn Central Light & Power	$1	Oct. 1
Penn Central Light & Power (extra)	10c.	Oct. 1
Philadelphia Company, pf, 5 per cent	$1.25	Sept. 2
Portland Electric Power, 2d pf.	1½	Sept. 2
White (J.G.) Engineering, pf.	1½	Sept. 1
White (J.G.) & Company, Inc., pf.	1½	Sept. 1
White (J.G.) Management Corporation, pf.	1¾	Sept. 1
Worcester Electric Light (extra)	$10	Aug. 9
Acme Wire, pf.	2	Aug. 1

*In cash scrip, † In stock scrip.

Company Reports

Among the company reports issued during the past week for the month of June are the following:

Name of Company	Gross Revenues for June 1924	Gross Revenues for June 1923
Arkansas Light & Power	$183,296	$138,543
Associated Gas & Electric	307,159	259,945
Bangor Railway & Electric	112,195	119,274
Blackstone Valley Gas & Elec.	343,887	363,317
Cities Service	1,649,962	1,509,973
Columbus Electric & Power	167,548	180,826
Consumers Power	1,385,079	1,301,991
Cumberland County Power & Light	301,529	304,798
Edison Electric Illuminating of Brockton	107,952	115,760
Fort Worth Power & Light	234,501	227,147
Galveston-Houston Electric	329,125	273,960
General Gas & Electric and subsidiaries	1,463,108	1,248,074
Kansas Gas & Electric	420,687	407,165
Los Angeles Gas & Electric	1,044,327	835,273
Lowell Electric Light	109,720	127,547
Milwaukee Electric Railway & Light	1,700,097	1,736,042
Mississippi Power & Light	104,194	91,543
Mississippi River Power	270,516	264,348
Nebraska Power	298,276	307,474
Nevada-California Electric	679,510	634,894
North American	6,065,401	5,961,486
Northern Ohio Electric	793,014	830,633
Northern Texas Electric	208,785	232,207
Pacific Gas & Electric	3,693,082	3,332,178
Pacific Power & Light	265,663	260,464
Portland Electric Power	850,181	897,427
Puget Sound Power & Light	979,267	948,671
Savannah Electric & Power	154,508	131,179
Staten Island Edison	228,297	208,811
Tampa Electric	178,092	170,003
Texas Power & Light	463,857	395,539
Utah Securities	839,917	793,831

Large Financing in First Week of August

The forecasts made last week in regard to the large financing in prospect for early August were fulfilled as far as electric light and power securities were concerned. Though only a few issues of this type of security appeared in the first week of the month, the offerings were large in volume. The fifteen-million-dollar issue of the Commonwealth Edison Company of Chicago of first mortgage collateral 5 per cent gold bonds proved to be a very popular offering, subscriptions amounting to more than $45,000,000 according to reports from Chicago. The price was 98½ and interest, yielding about 5.10 per cent. The proceeds from the sale of these bonds will be used partially to reimburse the company for capital expenditures heretofore made, a considerable portion of these expenditures being for the Crawford Avenue electric generating station, now under construction.

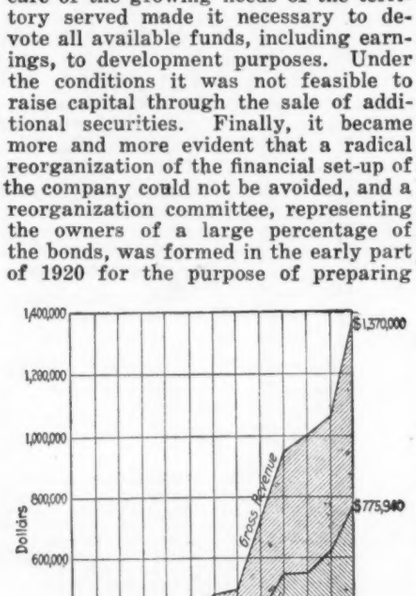
Another sizable issue was the Duke-Price Power Company's offering of first mortgage 6 per cent gold bonds at 99 and interest to yield about 6.08 per cent. The amount of the issue was $12,000,000 and the period was twenty-five years. A brief account of the recent consolidation of the Duke-Price interests appears elsewhere in this issue. The West Penn Power Company was represented in the week's activities by an issue of $2,063,000 of 7 per cent cumulative preferred stock, par value $100, at 103 per share, to yield about 6.80 per cent. Application will be made to list this issue.

Interesting Record of Utility Financing

How California-Oregon Power Company Escaped Receivership by Formation of New Company Which Was Able to Assume $10,000,000 of Bonded Debt

BY JOHN D. MCKEE
President California Oregon Power Company

IN THE early part of 1915 it became apparent that the old California-Oregon Power Company could not continue to pay coupon interest on outstanding bonds and at the same time provide the money necessary for capital expenditures in its rapidly developing territory in southern Oregon and northern California. While the earnings of the company were sufficient to pay the bond interest, the imperative demand for capital expenditure to take care of the growing needs of the territory served made it necessary to devote all available funds, including earnings, to development purposes. Under the conditions it was not feasible to raise capital through the sale of additional securities. Finally, it became more and more evident that a radical reorganization of the financial set-up of the company could not be avoided, and a reorganization committee, representing the owners of a large percentage of the bonds, was formed in the early part of 1920 for the purpose of preparing and recommending a plan of reorganization. The bondholders had voluntarily waived bond interest for five years as a preliminary effort to permit the company to continue on the original basis, fully confident that the territory which was being served would experience a rapid growth and that the money for line extensions and power development would be forthcoming without difficulty. The reorganization committee presented a plan which had the approval of the owners of $4,441,000 of the $4,442,000 of bonds outstanding. It resulted in a new company known as the California Oregon Power Company. All the property and assets of the old company were transferred to the new company, which assumed all of the debts and liabilities of the old company, the latter's bonds being canceled. The stock of the new company, of a par value of $100 per share, was issued in lieu of the bonds of the old company in the proportion of five shares of 7 per cent non-assessable preferred and ten shares of non-assessable common for each thousand-dollar bond of the old company. The new company created a new authorized bonded indebtedness of $10,000,000. This remarkable accomplishment, which is without parallel in utility financing, made it possible to effect the reorganization without resorting to a foreclosure and receivership, which would have been very difficult and expensive.



RISE IN GROSS REVENUE AND NET EARNINGS AFTER REORGANIZATION

The drastic nature of the reorganization above described enabled the company to develop almost overnight new revenues otherwise out of reach and impossible to finance. The financial set-up of the new company was made sufficiently elastic to permit the growth of the property and the development made necessary by the rapidly increasing demands on the system to be financed by the issuance of additional securities within the reasonable limits of the value of the property and its earning capacity. In 1921 $2,000,000 of 7½ per cent bonds were sold, the proceeds from which were used to repay floating debt and for capital expenditures, including construction, and during the years 1922 and 1923 a similar amount of 6 per cent bonds was sold to finance in part the expanding construction program. During this period, and also in connection with the construction financing, the company offered for sale three lots of its 7 per cent preferred capital stock, the three lots totaling 12,000 shares of a par value of $100 per share. All of this stock has been sold under the customer-ownership plan. The expansion of the construction program for the year 1924 to include the construction of two new power plants and an 82-mile, 110,000-volt transmission line made necessary additional financing to the extent of $5,000,000.

The industrial development of the territory from the early days of the company's history has more than ful-

filled all expectations. All of the energy to be developed by these new plants is contracted for or will be sold to enterprises that have indicated their desire to have additional blocks of power by certain dates. These enterprises are found in many lines of activity—timber, minerals, agriculture and other lines that cater to a growing population. The company also has wholesale delivery contracts with the Pacific Gas & Electric Company at the southern end of the California Oregon Power Company's transmission lines and with the Mountain States Power Company at the northern end. The financial reorganization set forth above and the achievements of the company which followed were made possible through the courage and optimism of the former bondholders and their faith in the growth and prosperity of the territory and the intrinsic soundness of the company. There is every reason to expect that this courage will be rewarded and this faith justified to the extent that the entire investment of the original bondholders will be restored to an interest-paying basis.

Utility Maturities Light for Rest of Year.—Public utility maturities, including gas, railway, water companies, etc., as well as light and power, for the remainder of the current year total $35,106,000 against $70,699,610 for the same period of 1923. The light and power bonds falling due include $1,250,000 of Boston Electric Light Company fives, due September 1; $1,500,000 of Utica Gas & Electric Company 7 per cent notes, due November 1; $1,078,000 of Commonwealth fives, due December 1, and $434,000 of National Light, Heat & Power Company 7 per cent notes.

Allis-Chalmers Quarterly Statement.—The Allis-Chalmers Manufacturing Company, Inc., in the earnings statement for the second quarter of 1924 reports sales billed totaling $6,910,265 and a net profit, after provision for federal taxes, amounting to $756,423. The unfilled orders on hand as of June 30, 1924, amount to $11,039,376. The sales billed in the second quarter of 1924 show an increase over the same quarter in 1923 of $828,195, or 13.6 per cent, and the earnings in the second quarter of 1924 show an increase over the similar quarter in 1923 of $128,004, or 20.4 per cent.

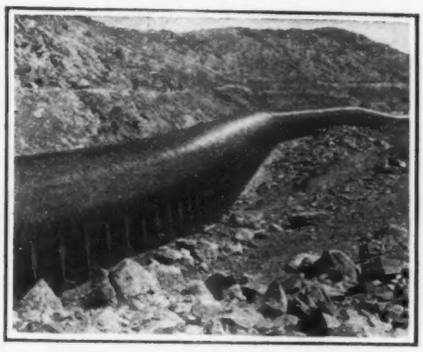
Duke and Price Interests Join.—It has been announced in Montreal that through the issue of letters patent to the Duke-Price Power Company Ltd., with a capital of $1,500,000, a definite form is given to the joining of the J. B. Duke interests of New York and the Price interests in Canada. These interests have been working together in the Chicoutimi and Lake St. John districts for some time. The purpose of the incorporation is to develop, distribute and sell electrical energy within that part of the Province of Quebec. It is understood that the principal source of the power will be the twenty-five-million-dollar development in progress at the Grand Discharge, where the work is being done by the Quebec Development Company.

Briefer News

New Electrical Building for McGill.—Owing to the increase in the activities of the electrical department of McGill University, Montreal, the board of governors has decided to construct a new building for that department.

Otter Tail Power Company Buys Midwest Plants.—Sale of the property of the Midwest Power Company at Casselton, Oakes, Enderlin and Lisbon, N. D., to the Otter Tail Power Company of Fergus Falls, Minn., has been approved by the North Dakota commission.

California Oregon Power Company's Link River Plant.—Advices from the California Oregon Power Company say that its East Side generating station on the Link River at Klamath Falls, which was started in December, 1923, will be in operation not later than August 15. Growth of the company's



load in that part of southern Oregon has been rapid, and the capacity of the plant (3,000 kw.) will be utilized to supply the increased demand. One of the features of its construction is a wooden-stave pipe line 12 ft. in diameter and 3,000 ft. long placed on a bench excavated from the east bank of the river. The illustration shows about two-thirds of it.

New York State Interconnection Continues.—Approval has been granted by the New York Public Service Commission to the projected interconnection between the New York State Gas & Electric Corporation of Ithaca and the Adirondack Power & Light Company, and the former company will immediately begin to construct a 110,000-volt line from the lines of the Adirondack company at St. Johnsville, Montgomery County, to the plant of the petitioner at Colliers. The line is already staked out.

Fitkin Buys Tarpon Springs (Fla.) Utility.—A. E. Fitkin & Company of New York City announce that they have completed the purchase of the Tarpon Springs Electric & Ice Company of Tarpon Springs, Fla., from the Southern Utilities Company. The Tarpon Springs company's territory is adjacent to that of the Pinellas County Power Company, the Fitkin property serving St. Petersburg and Clearwater, Fla., with electric light and power, and a subsidiary of the Tidewater Power Company. The 60,000-volt transmission line of the Pinellas County Power Company is being extended from St. Petersburg to serve Tarpon Springs, and it will also connect with the hydro-electric system of the Florida Power Company, on the west coast of Florida permitting interchange of power.

Georgia-Alabama Power Company Dam Attacked.—There is a possibility that the Georgia-Alabama Power Company's million-dollar dam across the Flint River, near Albany, Ga., may have to come down as the result of legal action begun by the United States government on the contention that the dam, which has been in use four years, was built without the authorization of Congress and constitutes an obstruction to navigation. The removal of the dam would affect power service to Albany, Moultrie, Pelham, Baconton, Leesburg, Smithville and Sales City.

Havana's Unpaid Electric Lighting Bill Threatens Service.—It is reported from Havana that only an extension of time granted to the city by the Havana Electric Railway, Light & Power Company for the payment of an overdue bill for $2,302,776 prevented a reduction of the city's lighting system by one-half on August 1. The Mayor has promised renewed efforts to raise the money, and President Zayas has interested himself in the situation. The high feeling existing between political factions in Cuba would, it is felt, make a state of semi-darkness in the capital especially unfortunate at this time.

Pennsylvania Power & Light Buys Independent Company.—The Pennsylvania Power & Light Company this week absorbed the Montgomery & Muncy Electric Light, Heat & Power Company, whose lines in central Pennsylvania will form a link in the Pennsylvania Power system between Sunbury and Williamsport. The amount paid was not made public, but it is understood to have been a substantial figure. The stock and bonds of the Montgomery & Muncy company were largely held by residents of Montgomery.

Competing Wisconsin Companies Consolidated.—What had promised at first to be a lively race between the newly organized Badger Light & Power Company of Madison and the Wood County Light & Power Company of Wisconsin Rapids for the privilege of supplying service to consumers in three central Wisconsin counties was brought to a sudden end after the race had been in progress for six months, when announcement was made that the Wood County company had withdrawn from the field and disposed of its franchises and equipment to the Badger company on condition that no interruption should take place in electric service to the communities in which the Wood County company had planned to build its lines. Duplication of service and the high expense of having two companies serve a territory which logically should be

served only by one prompted the withdrawal of the Wisconsin Rapids company from the field, its officers stated. The Badger company has launched one of the biggest rural electrification projects in the state, to cost thousands of dollars and cover a 50-mile area in three counties.

Brooklyn Edison Bores Its Own Wells.—The Brooklyn Edison Company has announced its intention to make its new Hudson Avenue station independent of the city water supply for cooling purposes. The company has sunk two artesian wells, 150 ft. apart, 86 ft. deep, equipped with turbine pumps, along the south line of its Hudson Avenue property. These wells have developed a production of 600 gallons per minute. To insure a reserve of this water the company has started construction of a tower 67 ft. high and holding 10,800 gal.

Colorado's Attorney-General Will Not Proceed Against Loveland Municipal Plant.—Attorney-General Williams of Colorado has refused to bring suit at the instance of the Public Utilities Commission of Colorado for an injunction to prevent the city of Loveland from going ahead with its municipal electric plant, now under construction in defiance of the commission's ruling that the city is adequately served by the Public Service Company of Colorado. The Attorney-General holds that Loveland is within its rights under the laws of the state as interpreted by its highest court.

Atlanta May Dam Chattahoochee.—Negotiations involving a plan for a new dam, waterworks and power plant for Atlanta, to cost $2,500,000, have been authorized by the waterworks committee of the municipal bond commission and the City Council in joint session. The purchase of a large strip of land on each side of the Chattahoochee River is contemplated, where a dam 40 ft. high across the river would form a lake many acres in extent, from which the city's supply of water could be drawn and which would furnish power to operate the entire waterworks system by electricity.

Rensselaer Polytechnic Centennial.—Official delegates from educational institutions, scientific organizations and engineering societies throughout the world, as well as from each alumni association and from each class since 1857, will assemble at the Rensselaer Polytechnic Institute, Troy, N. Y., on October 3 and 4 to celebrate the hundredth anniversary of the founding of that school, said to be the oldest college of science and engineering in any English-speaking country. Addresses will be delivered by Secretary Hoover, Governor Smith, the presidents of the national engineering societies, including Farley Osgood of the A. I. E. E.; Henri Abraham, president of the Society of Electrical Engineers of France; Sir Charles L. Morgan, president of the Institute of Civil Engineers of Great Britain; Luigi Luiggi, president of the Society of Civil Engineers of Italy; Roberto Gayol, president of the Society of Engineers of Mexico; Arthur Surveyer, president of the Engineering Institute of Canada; Presidents Stratton of the Massachusetts Institute of Technology, Birge of the University of Wisconsin, Graves of the University of the State of New York and Farrand of Cornell; President Michelson of the National Academy of Sciences, the Chinese Minister to the United States and other prominent men. Tablets will be unveiled, pageants held and President Ricketts of Rensselaer Polytechnic will with his wife give a reception.

Running "Rikishas" by Electricity.—The first epochal improvement in the Orient's typical passenger vehicle, the jinrikisha, since the addition to its wheels of pneumatic tires, is reported from Shanghai. A Hunan Chinese has, it is said, invented a four-wheeled "rikisha" which will run by electricity instead of being pulled, like the present machine, by a perspiring coolie. Since "jin" in "jinrikisha" means "man," the abbreviated form of the word is especially appropriate to the reformed rikisha, which will have four wheels and two seats, on the foremost of which a driver will perch over an electric battery that will provide the power. The electric rikisha is said to be four times as fast as the old-fashioned one and to be easily and safely driven. The tariff for travel in these swift little cars will be 60 cents an hour or $6 a day, and a clock affixed to the machine will serve as taximeter. Latest available figures credit Shanghai with 15,000 jinrikishas, in spite of the increasing number of automobile in that city and the extensive street-car system, and Peking, which has no street cars, with 25,000. In Japan there are more than a hundred thousand of them. The electric rikisha therefore seems to have possibilities.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See July 5 issue, page 50, for latest list.]

Conference of Electrical Leagues, Association Island, Henderson Harbor, N. Y., Sept. 2-6. Address Society for Electrical Development, 522 Fifth Avenue, New York.

Pennsylvania Electric Association—Bedford Springs Hotel, Bedford Springs, Pa., Sept. 3-6. H. M. Stine, 212 Locust St., Harrisburg.

Association of Edison Illuminating Companies—Griswold Hotel, New London, Conn., Sept. 8-12. P. S. Millar, 80th St. and East End Ave., New York.

Michigan Electric Light Association—Hotel Statler, Detroit, Sept. 9-11. Herbert Silvester, Edison Bldg., Ann Arbor, Mich.

New England Division, N. E. L. A.—Hotel Wentworth, Portsmouth, N. H., Sept. 10-13. Miss O. A. Bursiel, 149 Tremont St., Boston.

Rocky Mountain Division, N. E. L. A.—Hotel Colorado, Glenwood Springs, Col., Sept. 15-17. O. A. Weller, 900 15th St., Denver.

Colorado Public Service Association—Hotel Colorado, Glenwood Springs, Col., Sept. 15-17. J. F. Greenawalt, Mountain States Telephone & Telegraph Company, Denver.

Southeastern Division, N. E. L. A.—Birmingham, Sept. 15-18. E. T. O'Connell, Alabama Power Co., Birmingham.

Association of Iron and Steel Electrical Engineers—Pittsburgh, Sept. 15-20. J. F. Kelly, 513 Empire Building, Pittsburgh.

Great Lakes Division, N. E. L. A.—French Lick, Ind., Sept. 24-27. R. V. Prather, Illinois Mine Workers' Bldg., Springfield, Ill.

Association of Electragists International—West Baden Springs, Ind., Sept. 29-Oct. 4. L. W. Davis, 15 W. 37th St., New York.

American Electrochemical Society—Hotel Fuller, Detroit, Oct. 2-4. Colin G. Fink, Columbia University, New York.

American Electric Railway Association—Atlantic City, N. J., Oct. 6-10. J. W. Welsh, 8 West 40th St., New York.

Empire State Gas and Electric Association—Lake Placid Club, N. Y., Oct. 6-7. C. H. B. Chapin, Grand Central Terminal, New York.

American Institute of Electrical Engineers—Pacific Coast convention, Pasadena, Cal., Oct. 13-17. F. L. Hutchinson, 33 West 39th St., New York.

Kansas Public Service Association—Broadview Hotel, Emporia, Kan., Oct. 24-25. R. T. Smalley, Kansas Electric Power Co., Emporia.

Illuminating Engineering Society, Briarcliff Manor, N. Y., Oct. 27-31. N. D. Macdonald, 29 West 39th St., New York.

Northwestern Public Service Acquires New South Dakota Properties.—Another link in the power project undertaken in South Dakota by the Northwestern Public Service Company has just been added through the purchase of the properties of the Consumers' Utilities Company, which, with headquarters at Armour, had 160 miles of high-voltage wires, serving sixteen towns small and large. The newly acquired property will ultimately be connected with the Northwestern company's other properties at Yankton, Watertown, Huron and Aberdeen by high-tension lines.

Salem Company Shows Remarkable Growth.—Ten years ago, on June 25, 1,500 buildings were destroyed and about one-third in value of the property of Salem, Mass., was laid in ashes by a conflagration. Since that date the Salem Electric Lighting Company's lighting customers have increased from 2,930 to 7,308; the revenue from lighting has grown from $166,599 to $379,926, and the power income from $95,030 to $971,265. The generating-plant capacity has risen from 4,500 kw. to 22,500 kw., and the electrical output has gone from 7,506,000 kw.-hr. to 72,040,000 kw.-hr. At the time of the fire the company lost sixty-five power customers with a total load of 2,271 hp.

New Plant Opened at Fond du Lac.—The new water-power plant of the Minnesota Power & Light Company at Fond du Lac, Wis., has gone into commission on the completion of the first 15,000-hp. unit, which is to be followed by another of the same size. The dam is 600 ft. long and 85 ft. high. Power will be transmitted to the Thomson (Minn.) plant, a few miles distant, over a 110,000-volt line. From Thomson transmission lines run to Duluth and Superior and about forty other points and tie in with the Great Northern Power Company's system. (See ELECTRICAL WORLD for December 15, 1923, page 1238.) The cost of the Fond du Lac development is put at approximately $5,000,000.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in All Branches of the Electrical Industry

Julian C. Smith has been elected president of the Montreal Tramways & Power Company in succession to E. A. Robert, whose resignation severed his last connection with that company and its subsidiaries.

J. L. Harvey, formerly general sales manager of the Kansas Gas & Electric Company, Wichita, Kan., has been appointed as an assistant to H. N. McConnell, who has charge of the commercial activities of the Electric Bond & Share Company, with headquarters in New York City.

Professor Michael I. Pupin and **Dean George B. Pegram** of the Schools of Mines, Engineering and Chemistry, Columbia University, N. Y., have been designated by President Nicholas Murray Butler to represent Columbia University at the centenary of the Franklin Institute, Philadelphia, September 17-19.

Rufus L. Nelson, chief power engineer in the commercial department of the Utica (N. Y.) Gas & Electric Company, has terminated his connection with that utility to become vice-president and assistant general manager of the Foster Box Board Company at Utica, where his activities extend to the sales and production departments.

H. G. Harvey has been selected to succeed Robert A. Jones as general superintendent of the Pennsylvania Edison Company, which is an important link in the Pennsylvania-New Jersey power system of the General Gas & Electric Corporation. Mr. Jones has been placed in charge of utilities in the South recently acquired by the General Gas & Electric Company.

David E. Drake, "dean" of the sales department of the Westinghouse Electric & Manufacturing Company, who had been associated with the electrical industry for more than fifty years, has severed his connection with the Westinghouse company after thirty-four years of service. Mr. Drake was superintendent of construction of the United States Electric Light Company when it was absorbed in 1888 by the Westinghouse Electric Company to form the Westinghouse Electric & Manufacturing Company, and be continued in the same work, entering the sales department six years later. A gold-filled purse was presented to Mr. Drake at a luncheon in his honor given at the Railroad Club by officials and members of the Westinghouse sales department. He will make his future home in San Diego, Cal.

George H. Ahlborn, formerly head of the power sales department of the Kansas Gas & Electric Company, Wichita, Kan., succeeds J. L. Harvey as general sales manager of that company. Mr. Ahlborn was previously connected with the Studebaker Corporation at South Bend, Ind., as electrical engineer, and previous to that association he spent four years with the Bureau of Standards and four years on the operation and supervision of all construction on a light, power and street-railway property at Zanesville, Ohio.

E. W. Goldschmidt Promoted to New Office

E. W. Goldschmidt, for the past twenty-two years district sales manager of the Wagner Electric Corporation in New York, has just been appointed Eastern executive representative of that company with headquarters in New York, according to an announcement made by President W. A. Layman. Mr. Goldschmidt, who is a

E. W. GOLDSCHMIDT

graduate of the Illinois University, class of 1897, spent twelve years in the employ of the Western Electric Company in its central-station department before affiliating himself with the Wagner company, where his period of service has covered twenty-three years.

In his new position Mr. Goldschmidt will be primarily responsible for the relations of the Wagner company with central-station companies throughout the eastern part of the United States, and particularly for co-operation with those companies in the matter of power-factor research and correction, the Wagner company, as manufacturer of the Fynn-Weichsel motor, having an especially keen interest in this important subject.

Henry R. Whiton, formerly of the Boston office of Stone & Webster, Inc., has been appointed illuminating engineer of the Eastern Texas Electric Company, Beaumont, Tex.

J. F. Jones, vice-president of Charles Cory & Son, Inc., New York, sailed for Europe on August 2 aboard the steamship *George Washington* to attend the British Empire Exposition at Wembley. While abroad Mr. Jones will also investigate marine and industrial business conditions in England and on the Continent.

W. LeRoy Williams, who has been connected with the Utica Gas & Electric Company for the past two years as assistant power engineer in the commercial department, has been appointed chief power engineer of the commercial department to succeed Rufus Laurence Nelson, resigned.

E. M. Morecock, manager of the Norton (Va.) office of the West Virginia Engineering Company and consulting engineer for many of the large utility companies in Kentucky, Virginia and Tennessee, has joined the staff of the Mechanics' Institute, Rochester, N. Y., as instructor in electrical engineering, effective September 1.

A. R. Small has recently been appointed chairman of the electrical committee of the National Fire Protection Association, succeeding Dana Pierce. Mr. Pierce, after serving as chairman of the committee since 1919, necessarily gave up the work because of new and larger duties resulting from his recent promotion to the office of president of the Underwriters' Laboratories, Inc., and also in view of the newly adopted policy of the National Fire Protection Association in placing a time limit upon the service of the chairmen of its technical committees. Mr. Small brings to the work a continuous contact with it extending over a period of eighteen years, during the last five of which he served as chairman of the standing committee on devices and materials. As vice-president and formerly superintendent of the label service of the Underwriters' Laboratories, he is well acquainted with the problems and personnel of the entire electrical fraternity concerned with code matters. Mr. Small plans to work actively to extend the scope and influence of the National Electrical Code, which for many years has been generally recognized as the fundamental guide in electrical practice.

Obituary

Clarence C. Sibley, Eastern representative of the Dayton Fan & Motor Company and manager of the American Wire Mold Company in New York, died suddenly August 6 of heart disease. Mr. Sibley was a pioneer in the electrical industry and established one of the first jobbing houses in New York City. He was closely identified with the development of the electrical business and formed the Sibley & Pitman Electric Corporation. Mr. Sibley was fifty-five years of age.

John S. Heinz, assistant treasurer of the Adirondack Power & Light Corporation, Schenectady, N. Y., died recently of pneumonia. Mr. Heinz entered the service of the Schenectady Illuminating Company in 1913 as assistant to the auditor, and when that company was merged into the present company he became assistant to the treasurer. Subsequently he was made assistant treasurer.

Commission Rulings

A Holding Company Not a Utility.—Refusing permission to the Tennis Company, a New Jersey corporation, to sell the Madison (Ind.) Light & Power Company to the Louisville Gas & Electric Company, a Delaware corporation, the Indiana Public Service Commission said: "The petition in this case shows that the purchaser of the stock is not a utility but is a holding company. The provisions of the statute do not apply to a transfer of this kind, and this commission is without jurisdiction because it is a statutory body and has only such jurisdiction as is specifically delegated by statute."

Principles Underlying Rural Service.—An allowance of 4 per cent for depreciation was considered sufficient for well-constructed rural electric lines by the Wisconsin Railroad Commission in adjudicating a complaint against the rates of the Osceola-Farmington Electric Company. An allowance of 1½ per cent for all taxes including property and income tax was made, as were an allowance of 2 per cent to represent the difference between an 8 per cent return and a normal interest rate of 6 per cent and an allowance of 2½ per cent to cover excess operating expense such as reading meters, clearing trouble and maintenance work. A normal return, depreciation and taxes should be deducted," the commission said, on an amount of construction necessary to serve the average urban consumer when determining the excess cost of rural electric lines by making specific allowances for fixed charges and excess operating expenses. An allowance must also be made for excess transformer losses. A rate applicable to combined light and power installations was considered preferable to separate lighting and power schedules, and a service charge for rural electric power service was made lower than existing conditions warranted to develop business.

Overhead Cost and Operating Expense.—No injustice results, according to the California Railroad Commission's findings in a rate-fixing hearing for the Coast Counties Gas & Electric Company, from a refusal to modify a valuation because overhead cost has been charged to operating expense, if the past return would have been inadequate after deducting depreciation and maintenance and if consumers are protected against the necessity of making up any deficiency in the depreciation reserve or against payment for deferred maintenance. Among other principles laid down by the commission in this case were these: The amount of additional capital represented by equipment which is used but not owned by an electric utility should be included in the rate base when the authorized rate schedule contemplates the ownership of all transformers by the utility. A public utility should account for such reasonable depreciation reserves as should exist at any specified time, as well as for the depreciation annuities which it is permitted to collect from rates in the future, and this also applies to interest upon the accumulated reserve which must supplement these annuities if they are to be adequate. Any estimate of the depreciation reserve which should exist at any time involves the existing condition of various elements of the property and their degree of usefulness to the system, as well as the past earnings. Only that property which is treated as operative should be considered in a rate proceeding. Cost of deferred maintenance work should not be included in estimates of future operating expenses of a public utility which has earned sufficient revenue in the past to take care of this work.

Recent Court Decisions

Chattel Mortgage on Power Line Not in Existence Held Inferior to Liens for Materials.—A chattel mortgage upon a power line not yet in existence can only attach itself to such property in the condition in which it comes into the mortgagor's hands, declared the Supreme Court of Minnesota in St. Paul Electric Company vs. Baldwin Engineering Company. Where there are liens for materials used to bring the property into existence, they are superior to the general mortgage lien, even though they be junior to it in point of time. (199 N. W. 9.)*

Functions of Courts in Review of Commission Valuations.—The United States Supreme Court, in Pacific Telephone & Telegraph Company vs. Kuykendall, has determined that under the statute of the State of Washington providing for valuation of the property of a public utility and for a review of findings of the Department of Public Works by the Superior Court on writ of review and by the Supreme Court of the state on appeal, the function of the courts in fixing the valuation of the property is not confined to the judicial review of the work of the commission, but the courts are a part of the valuation tribunal, and can set a valuation and make a new one. (44 S. C. R. 553.)

Valuation of Plant by "Modified Sinking-Fund Method" Held Erroneous.—In two suits brought by the Pacific Gas & Electric Company against the City and County of San Francisco the Supreme Court of the United States has held that the adoption, in fixing a valuation for the company's gas plant, of the "modified sinking-fund method," involving an estimate of the lives of the different structural units and an annual allowance set aside from the rates received as a reserve for future replacement on a 5 per cent compound interest curve, the capital basis of return being depreciated each year in an amount exactly corresponding with yearly additions to the reserve, assuming that loss of plant units by obsolescence, inadequacy and physical decay can be forecast with substantial accuracy and provided for in advance of abandonment and replacement, instead of estimates of competent experts made after examination of structural units and concerning existing conditions, was erroneous, in view of the installation of inventions which had reduced the cost of manufacture and had necessitated new outlay of money and abandonment of property theretofore valuable and the adoption of the reduced cost of manufacture for estimating net returns. (44 S. C. R. 537.)

Instruction that Electric Company Must Use High Degree of Care Not Erroneous as Directing Verdict.—Sustaining a verdict for the plaintiff in a suit for damages from electric shock brought by Georgia Hohimer against the City Light & Traction Company, the Kansas City Court of Appeals held that no directed finding was implied in the trial judge's charge that it was the duty of the defendant company to insulate its wires and use a very high degree of care to keep the insulation in such condition as to make them reasonably safe. Plaintiff was injured in endeavoring to rescue a boy who was killed while grasping a broken telephone wire which it was alleged was in contact with 2,300-volt wires from which the insulation had been worn. (262 S. W. 403.)

No Harm Inherent in Temporary Increased Rates.—In denying a rehearing of the action brought by the McAlester Gas & Coke Company against the Oklahoma Corporation Commission and decided in the company's favor (ELECTRICAL WORLD, July 12, page 93), the Supreme Court of Oklahoma, which had fixed temporary rates for the company in excess of those prescribed by the commission, said that no harm could come to either party by a temporary increased rate, for the reason that should the further investigation in the case show that the company is not entitled to the rate increase the consumers will be given a refund representing the entire amount collected in excess of former rates. If, on the other hand, the company were found to be operating its business at an unfairly low rate, then there would be no practical way for the company to reimburse itself. The court also stated that some of the findings of the commission were based on oral reports made by one of its engineers and that it cannot consider such matters until they are incorporated in the evidence and properly certified to the court. The court, however, denied the application of the company for a release from orders of the commission directing it to furnish records and data for further hearing in the case. The company claimed that the records required were unnecessary and that the request for this information was made "willfully for the purpose of annoying and harassing the company." The court held that if the company feels thus aggrieved, it should first apply to the Corporation Commission for modification of these orders.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

Electrical Men See Good Business Ahead

Letters from Manufacturers and Jobbers Discussing the Immediate Outlook—Strong Confidence Is Shown in Situation

AS IN every period of business depression, electrical men today are eagerly listening for experience and opinion that will tell them how the other fellow's business is and what he thinks about it. It is the only way there is of reading the signs and measuring the trend. For the purpose of sounding out a representative number of electrical manufacturers and jobbers in diverse lines and locations, the ELECTRICAL WORLD addressed a letter to a carefully selected list asking each one how he found business at the moment, when he expected improvement in sales, how he thought the year would compare with 1923, and what of the year to come. Some of the answers follow. They show, in the confidence they express and in the conditions upon which opinion is based, a high degree of optimism that should afford great satisfaction to the electrical manufacturer and jobber.

Business Will Start Improving Early in the Fall—Next Year Good

From WILLIAM H. THORNLEY
President Tubular Woven Fabric Company, Pawtucket, R. I.

IT IS my belief that favorable influences predominate in the present business situation. With so many manufacturing industries at such a low ebb as they are now, it would seem that there is only one way for them to turn, and that is for the better.

The present more favorable outlook for the farmers, the bigger cotton acreage planted and easy money now existing all tend toward improved business conditions. However, I do not think that this improvement will come with a rush, but I do expect business to start improving slowly early in the fall and accelerate more as we go into the winter, so that by the latter part of the year we should be in a period of good business activity which ought to continue well into 1925.

With better general business we should see an improvement in the electrical industry, and I think it will be reasonably uniform throughout the different branches of that industry. It is logical, however, to expect better conditions for the manufacturers of large apparatus, of industrial and railroad equipment, than for those manufacturers supplying the needs of the building trade. We seem to have passed the peak of building construction, and while there will still be a lot of it, it is not probable that it will improve in a very marked degree.

For these reasons, while our company is looking forward to a reasonably fair business in the fall, we do not expect anything abnormal, and in fact we would prefer that business come along slowly but in the right direction, with good staying power, rather than to develop rapidly for only a short period of time.

Meter Manufacturer Optimistic—Sees Trade Revival Soon

From R. C. LANPHIER
Vice-President Sangamo Electric Company, Springfield, Ill.

OUR domestic sales for the first six months of 1924 were larger than for the same period last year, although last year was the best we had ever had. There has, of course, been some falling off the last two months, which we attribute principally to the usual uncertainty in a presidential election year, and now that Davis has been nominated by the Democrats, we feel that there isn't much to worry about, for we will have a good President whether Coolidge or Davis is elected.

Many of the biggest bankers and industrial men feel that we shall see a big revival of trade by September 1. Our own business at the present time indicates this, as we are getting an unusual volume of good orders for midsummer and have been assured by our offices in all parts of the country, except middle and southern California, that prospects are now brighter than a few months ago.

Summarizing, therefore, I may say that our feeling for the remainder of the year is distinctly optimistic, but I wouldn't venture a guess on 1925. Personally, I feel that if Coolidge is reelected, and if the Dawes reparations report is adopted by the present conference in London, as now seems quite well assured, there is no reason why 1925 should not be a good year for the whole world.

Last Year Best in High-Tension Equipment—This Year Better

From H. W. YOUNG
President Delta-Star Electric Company, Chicago

IN MY opinion there is no reason for the slightest doubt as to the economic prosperity of the electrical business. We are in the most promising, the livest and one of the most necessary fields of modern civilization. If every one of us will keep thinking about the electrical business and stop talking about what we think will happen if the election goes one way or another, then we will be working for the industry and will not be instilling doubt into the minds of those with whom we come in contact.

Just a few days ago a salesman called and started talking about business in general, how bad it was, steel tonnage had dropped, labor was now going to get what was coming to it, etc. Now, I was in the market for the material he was supposed to talk about and sell; but after listening to his wail I began to wonder if his company was thoroughly sound. So he left without the order.

So if you are trying to help the electrical industry, tell us all to get down to real hard work, stop starting an electrical hoof-and-mouth epidemic, and warn every man you can reach that if he is looking for a slump he will not be disappointed, for business will begin to decline from the very moment he gets into that frame of mind.

As to high-tension equipment, 1923 was the best year this branch of the business ever experienced; 1924 will be at least 15 per cent ahead of 1923, and if 1925 does not show its proper increase, it will be our own fault.

Lighting-Fixture Business Will Break Back to Normal Next Year

From HERMAN PLAUT
President L. Plaut & Company, New York

SPEAKING of the lighting-equipment industry, we are fortunate enough to be busily engaged in our manufacturing department on account of the large amount of building now in progress throughout the country. Within a radius of 50 miles of New York there will be completed this year over a thousand million dollars in new building enterprises, and this is sufficient to test the capacity of all manufacturers of lighting equipment.

The saturation point in the building industry has probably been reached. The building program in the country is believed to have fallen behind about eight thousand million dollars, due to the war, and practically all of this backward building has been about completed, and in 1925 business conditions should again become normal. This will be a very unhappy time for firms in this industry, and we look for a number of failures. Firms are now manufacturing with the highest wages and with a heavy overhead, and when business drops off in a large measure the weaker manufacturers will find that they cannot support their percentage and will be driven to the wall. It is a very unfortunate situation, but it exists.

Manufacturers have been selling their products without knowledge of manufacturing costs. Their selling prices have not been based on raw material

and labor, but on existing competition, with the result that a very large percentage of goods made in this industry are sold either at cost or at a loss.

Jobbing and Manufacturing Business on the Up Grade—Election Discounted

From W. J. VAN WINKLE
President Port Glover Electric Company, Cincinnnati

IT IS an old story that any man will "go broke" who is a continuous bear on the future of America, and exactly the same rule should and does apply in a greater measure to the electrical industry. Unfortunately the science of business is not sufficiently understood to prevent temporary recessions, but we do know that from each of these the electrical industry has gone forward to greater achievements. Prophetic vision is not necessary to read the story that is being told by the stretching out of new power lines which greet the eye on every hand.

Coal is the basis of practically every industrial development, and it is to the center of coal that we are directing much of our selling effort. This industry has been blamed for real and fancied ills, many of which will be solved by the use of electrically driven machinery. For some years past we have been able to gage very closely the activity of the coal fields by the demand for a certain type of resistance which we manufacture for coal-mining machines and locomotives. During May and June the business in this line reached an unusually low ebb, but the month of July has seen a very considerable improvement in demand, and a substantial amount of business has been booked for August delivery. It is also an interesting fact that our switch and panel board factory, producing equipment at a higher rate of speed than at any time in the past, would be kept busy continuously for five months to come on orders already in our hands.

Briefly, I believe that business conditions are on the up grade and that the presidential election has already been pretty well discounted. This fact is well proved by the rise in price of farm commodities.

Stocks Liquidated in Glass Industry—No Cause for Worry

From EDWIN B. GILLINDER
President Gillinder Brothers, Inc., Port Jervis, N. Y.

THERE is no question that business has slowed up in most branches of industry during the past few months, and the glass business has been no exception. I believe the cause for this is overproduction for the market in which our company is operating. At the beginning of the year the jobber and dealer were well stocked. The manufacturer in most cases had accumulated stock. These stocks had to be liquidated, and that is what has been happening during the past six months.

My opinion is that stocks have been fairly well liquidated. The jobber and dealer have been buying very cautiously. The number of pieces of mail coming into our office is about as large as when business is good. The orders, however, show that such purchases are for immediate needs, and where sight deliveries cannot be made the customer seems to be hurt. This would appear to show that stocks are depleted and that the time is near when stocks will be filled up if jobber and dealer expect to take care of their trade. I expect a reasonable amount of business for the rest of the year. It will probably not equal 1923, but with economy and care and the sale of merchandise at a profit, I believe it will be possible to show a gain for the year.

Regarding 1925 in our industry, I believe it will be about on a pre-war basis. This is not a cause for worry. Present business has been largely new work. There is still a large amount of new buildings being contracted for, and this, together with the tremendous field of unwired houses and poorly lighted commercial establishments, should produce business for 1925.

Business Ahead Best Since 1920, Says Prominent Middle West Jobber

From F. M. BERNARDIN
President B-R Electric Company, Kansas City, Mo.

IT IS estimated that the volume of business in this section will show a decrease of approximately 15 per cent for the first six months of this year as compared with a similar period of 1923. However, in my opinion, the tendency is toward better conditions for the remaining months in the year. Kansas will market a huge surplus of wheat and the proceeds will be used to pay bills. It is estimated that approximately 60 per cent of the crop is being sold at this time by farmers pressed to pay their debts. The remainder will be held for higher prices confidently expected this fall.

The fan business has been disappointing owing to unfavorable weather conditions. The usual demand for fans in this section has not materialized. Radio, however, on the contrary has this year extended farther into the summer months than in the previous years. Much outside construction work has been in progress by the central stations owing to the absorption of plants in smaller communities.

We do not hesitate to express the opinion that the fall and winter months of 1924 should bring the best wholesale and retail activity to Kansas City that has been experienced since 1920. Much of our trade territory has a three-year accumulation of unfilled wants which the 1924 crops will in a large measure satisfy.

Expects Pole Business to Be Dull Until First of Year

From E. W. ROCKAFELLOW
Vice-President National Pole Company, New York

I DON'T look for an increase in business before the first of the year. I think there are two reasons for the slowing down. One is the old-fashioned notion about presidential year and the other is the uncertainty of Europe's accepting the Dawes plan. It will take the rest of the year to settle both questions. So, as I have said, I don't look for improvement before the first of the year.

Washing Machine Industry Gaining Steadily with Prospects Bright

From ENOCH B. SEITZ
Executive Secretary Washing Machine Manufacturers' Association, Chicago

THE washing-machine industry has every reason to feel encouraged as a result of sales for the first six months of 1924, the largest for this period since 1920.

We are running considerably above the average of general business, and our position should be maintained during the next half year for the reason that what we have done for the first six months has been done without any large amount of selling in the rural districts. The purchasing power of farmers, and all that goes with it, should take on good proportions after the crop movement of this year.

Our sales in the larger cities remain uniformly good and should so continue, as labor on the whole continues to be employed and at a remarkably high wage scale. We are finding that the let-down in the automobile industry is reflected in increased sales of household appliances, the purchase of which has been long delayed in many homes as a result of "living up" to the family automobile.

The increased number of homes wired has continually widened our market. Our estimate is that our annual sales will equal approximately 50 per cent of the new residence customers added by the lighting companies. On the whole, we have an electric washer only in one of every three wired homes. Our market is assured, and in the absence of extreme depression we should continue at our present rate of production and sales.

Expect Year's Total Better than 1923 in Safety Switches

From T. J. KAUFFMAN
Treasurer and General Manager Square D Company, Detroit

THE six months' period just closed has been the most prosperous in the ten years' history of this company. We expect our business for the remainder of the year 1924 to be as good as it was during the first six months of 1924. We do not expect a marked quickening of sales in September, however. The total for the year 1924 will be slightly in excess of the year 1923 in our field, but we would not attempt to predict what will happen in 1925.

And H. W. Bliven, vice-president Harvey Hubbell, Inc., Bridgeport, manufacturers of wiring devices, adds this word:

While business conditions have improved in the last two or three weeks, there has been no radical change in the volume of business. We feel that the fall is going to bring a better situation.

Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

ENCOURAGING news continues to come from practically all sections of the country except New England and southern California. Manufacturers, jobbers, contractors and dealers report an increase in both inquiries and orders that would seem to indicate growing vigor in the market and some recovery in trade. The question asked is how much this should be considered the first movement in the regular seasonal revival expected in the early fall and usually preceded by considerable advance buying in August, or how much is it an actual recovery from the period of general business depression from which all industry has been suffering?

Opinions differ on this point. It is interesting to note, however, that the National Industrial Conference Board has just issued a statement that the business tide has turned and the end of the slump is in sight.

The advance in the copper market has been reflected in a 3 to 5 per cent increase in the price of rubber-covered wire. If the higher prices of copper, cotton, rubber and lead continue, further advances are looked for in wire and in cable. The demand has been greatly stimulated by these conditions. A reduction in a prominent line of radio material has brought added activity to this extensive market also.

In New England business is steady with sales somewhat below 1923, and central-station construction continues active. Sales have been better in the New York district with considerable industrial buying from the jobbers. The building outlook is good. Reports from the Southeastern States show still further pick-up in the sales of wiring materials and appliances. Electrical men are busy there, and optimistic. In the Middle West there is improvement in general business. Central-station construction has revived somewhat and appliance sales are stronger. Contractors are buying more in the Northwest and collections are good, but in general business is rather quiet on the Pacific Coast.

Simplification of Radio Apparatus to Further Industry

MUCH progress has been made in the work of standardization, or, as it is better termed, simplification of the radio industry, through the Radio Apparatus Section of the Associated Manufacturers of Electrical Supplies. The activities of the section have extended to a consideration of nearly all of the principal elements of radio receiving apparatus. Battery sizes, battery terminals, number and location of terminals, plug dimensions, screw dimensions are only a few of the many items that have been standardized. The committee is also undertaking an exhaustive investigation of the problems arising in connection with interference to broadcast reception caused by the operation of carbon arc-moving picture machines, and similar apparatus.

The radio industry has profited by the study and consideration of the work necessary in establishing standards in other branches of the electrical industry and has thus been enabled to make remarkable progress. The standards and simplification measures which have been adopted are not reflected in new devices of heretofore unheard of quality and will not mean the obsolescence of the apparatus now in use, but will mean a great deal to the radio user in a more convenient application of radio to the home. Such measures will necessarily be productive of greater and wider use of the radio. The committee in a report says that the present status of the radio industry indicates every assurance of a continued upward trend.

Wiring-Device Manufacturers Producing Sizable Output

REPORTS from several manufacturers of wiring devices visited last week by a representative of the ELECTRICAL WORLD encourage the belief that a reasonably good business will soon be coming into these plants and that little curtailment in operating hours is likely beyond the vacation shutdown of two weeks which a number of these firms are planning for the first part of August. A fair volume of business was handled by these plants during the first quarter of the year, and since spring considerable manufacturing has been in progress for stock purposes. Jobbers have been carrying such low stocks in many distributing centers that a fairly steady flow of moderate-sized shipments has been under way this summer. While nothing like the full capacity of the wiring-device plants has been drawn upon lately, there does not appear to have been much if any curtailment of hours. There has, of course, been some "weeding out" of the less desirable labor elements. The demand for heavy-duty switches has been good, owing especially to the increased interest shown by the public this year in electric

VALUE OF ELECTRICAL EXPORTS FOR JUNE, 1924, COMPARED WITH CORRESPONDING MONTH IN 1923

(Issued by Bureau of Foreign and Domestic Commerce)

	June 1923	June 1924
Generators:		
Direct-current:		
Under 500 kw.	$81,907	$70,963
500 kw. and over	82,531	124,594
Alternating current:		
Under 2,000 kva.	13,926	17,795
2,000 kva. and over	49,030	.....
Steam-turbine generator sets	*	54,265
Accessories and parts for generators	(2) 31,449	229,471
Self-contained lighting outfits	76,164	69,185
Batteries:		
Flashlights		94,920
Other primary	118,056	65,946
Storage	203,250	239,806
Power transformers	265,755	236,803
Other transformers	119,242	222,995
Rectifiers, double-current and motor generators, dynamotors, synchronous and other converters	71,671	142,550
Switchboard panels, except telephone	89,635	183,307
Switches and circuit breakers over 10 amp.	172,530	372,749
Fuses and fuse blocks	21,547	20,307
Watt-hour and other measuring meters	44,761	14,624
Volt, watt and ampere meters and other recording, indicating and testing apparatus	66,034	116,319
Lightning arresters, choke coils, reactors and other protective devices	59,051	59,130
Motors under 1 hp	158,921	190,830
Stationary motors:		
1 hp. to 200 hp.	267,701	136,208
Over 200 hp.	47,806	25,891
Railway motors	42,146	94,499
Electric locomotives:		
Railway	129,492	468,680
Mining and industrial	19,573	9,014
Other motors	26,882	†
Starting and controlling equipment:		
Industrial motors	*	95,389
Electric railway and vehicle	*	1,239
Rheostats, controllers and other starting and controlling equipment	153,417	†
Accessories and parts for motors	98,093	225,985
Electric fans	43,196	98,845
Electric lamps:		
Incandescent:		
Carbon filament	4,771	2,645
Metal filament	121,095	90,134
Other electric lamps	13,972	22,083
Flashlights	47,303	74,596
Searchlights and projectors	14,562	23,955
Motor-driven household devices	100,036	74,476
Domestic heating and cooking devices	115,031	81,565
Industrial electric furnaces and ovens	18,776	16,744
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries	109,944	101,807
Radio and wireless apparatus	223,589	307,884
Telegraph apparatus	28,500	89,154
Telephone apparatus:		
Magneto telephones	12,678	14,201
Other telephones	20,170	63,255
Magneto switchboards	6,017	.....
Other telephone switchboards	10,842	127,549
Other telephone equipment	*	167,474
Railway signals, switches and attachments	36,045	33,782
Bells, buzzers, annunciators and alarms	9,405	19,445
Spark plugs, magnetos and other ignition apparatus	181,850	178,408
Insulating material	113,656	133,340
Metal conduit, outlet and switchboxes	27,085	51,710
Sockets, receptacles and lighting switches	123,869	102,473
Other wiring supplies and fixtures	165,405	†
Electric lighting fixtures, interior and street	*	48,329
Other wiring supplies and line material	*	106,847
Other electrical apparatus, not elsewhere specified	613,208	600,063
Globes and shades for lighting fixtures	38,332	21,340
Electrical glassware, except for lighting	12,087	32,678
Electrical porcelain	164,920	175,991
Electrical carbons, carbon brushes, electrodes	196,494	253,733
Insulated wire and cable (iron and steel)	47,365	33,124
Other manufactures of aluminum	94,261	43,731
Copper:		
Bare wire	174,411	227,399
Insulated wires and cables	257,272	252,448
Total electrical machinery and apparatus and supplies	$5,674,717	$7,254,672

* Not separately stated prior to January 1, 1924. † Discontinued beginning January 1, 1924.

ranges and small industrial heating apparatus. Prices are considered unsatisfactorily low by some manufacturers on "bread-and-butter" wiring devices, specialties yielding the real profits at present, according to one large house.

Metal Market Stronger—Copper, Zinc and Tin Advance

THE sudden advance in the London standard copper market on Monday had an immediate effect in the New York market. Prices stiffened and sold up to 13¼ cents with some producers asking 13⅜ cents but no sales recorded at this level. Copper is readily obtainable at 13⅜ cents. Consumers are interested not only in prompt-shipment copper but also in deliveries far ahead into next year.

Zinc and tin are also up in price and lead is a little easier.

The official contract price of the American Smelting & Refining Company continues at 7.50 cents per pound in New York. The market may be said to have reached a balance, with producers not very anxious to sell and consumers not particularly eager to buy.

NEW YORK METAL MARKET PRICES

	July 30, 1924 Cents per Pound	Aug. 6, 1924 Cents per Pound
Copper, electrolytic	13¼	13⅜
Lead, Am. S. & R. price	7¼	7¼
Antimony	8¼	8¼
Nickel, ingot	27	27
Zinc, spot	6¼	6.175
Tin, straits	49¼	52
Aluminum, 98 to 99 per cent	27	28

Zinc registered a pronounced increase from 5.95 to 6.175 cents, East St. Louis. The New York market is 35 points above East St. Louis. Sales of all metals have been good.

Jobbing Business Improves in New York District

ELECTRICAL jobbers in the New York district feel that general business has picked up somewhat in the past week. Inquiries are coming in more rapidly and there is a constant flow of small orders—still hand-to-mouth buying, much of it, but a larger volume and occasional orders for stock. Considerable business has begun to come from industrial plants for construction material required in the completion of new plants and in the changing around of light and power equipment. Central stations also are somewhat more active. There has been good weather for fans, but it comes too late and jobbers report totals anywhere from 10 per cent to 50 per cent under last year or more. Wire business has been stimulated by the 3 per cent increase on rubber-covered effective on August 1 and the natural expectation of another rise, but there is also more selling of special wire to industry.

The New York Electrical Board of Trade reports that building contracts let in New York for the first six months of this year were 0.564 per cent greater than for the same period of 1923, against increases of 0.05 per cent in Boston, 0.008 per cent in Philadelphia and 0.14 per cent in the South, and decreases of 0.073 per cent in Chicago, 0.131 per cent in Pittsburgh and 0.531 per cent in Minneapolis. This would seem to indicate a rather favorable building situation.

Important price reductions in "R.C.A." material and the publication of the manufacturers' guarantee against further reduction until February, 1925, has stimulated the radio market. Domestic appliance sales are quiet during this vacation period, flatirons being the principal item in demand.

Construction Materials and Appliances Pick Up in Southeast

BUSINESS sentiment shows a marked improvement in the southeastern states, and with the exception of the textile mills, where no material change is anticipated until fall, the outlook in all lines of business reflects a spirit of optimism. No large industrial projects have been announced in the past few weeks, but a number of plans are up for active consideration. Building permits in Atlanta for July amounted to $1,712,348, more than doubling those for June. Sales of electrical construction materials, such as conduit, wire, fittings, outlet boxes, etc., are very good, and the demand for line materials continues satisfactory. Efforts to keep up the dollar volume, despite price reductions, have resulted in unusually good sales of lamps for this period of the year. Lighting fixtures, both commercial and residential, are moving well. Several large central-station companies are planning to undertake sales campaigns of commercial fixtures during the next thirty days, and this will considerably stimulate the movement.

Owing to the fact that September 1 is "moving day" in this section and that a considerable number of new residences are completed in August, the electrical retail trade has picked up sharply during the past week, and dealers report good business in practically all lines, particularly fixtures, heating appliances, portables and lamps.

New England Trade Steady with Good Appliance Sales

STEADY business, with the promise of decided improvement in the near future, is reported in New England electrical circles. Sales are running somewhat below last year's figures in many lines, but nevertheless a good business is being handled. Northern New England is buying domestic appliances more freely, and some of the more depressed textile centers report a better outlook. Washer sales are dull, but vacuum cleaners are being sold in fair numbers and the demand for flatirons is surprisingly active. Wire is moving faster in response to recent price increases. Outdoor construction by central-station companies is being widely pushed. Money is easy and industrial conditions are beginning to show improvement. Here and there manufacturers of electrical specialties are enlarging their plants and taking on more employees, although the larger companies are not as a rule expanding. Little lack of employment is in evidence in the electrical industry in this section. Prices are quiet.

Reviving Optimism of Farmers Improves Middle West Business

DEFINITE evidence of improvement in general business was observed early this week in the reports of two large mail-order houses in the Middle West. One of these indicated a gain of 15½ per cent over July, 1923, which shows that the farmer is again in a buying frame of mind. The month of August is expected to exceed the sales of July. Central-station construction continues, while construction in all lines apparently revived considerably this week. Reports received from the Northwestern district indicate that quite an extensive program is under way. Several rather good orders for high-tension equipment were received this week and the number of requests for quotations increased.

Code wire advanced August 1 approximately 5 per cent, nearly all sizes being affected. "BX" and other armored conductors have not advanced as yet, although they are expected to follow the advance in code wire. The only changes in this line were in the prices of single-strip and double-strip, which were made the same last week. Appliance sales have revived somewhat, and it is expected that the month of August will show improvement over July. Vacuum-cleaner sales have headed the list this week, owing to a new idea in attachment holders produced by one of the large central-station companies. Building activity in the city continues, although the number of permits taken out this week, together with the money value, just about equalled those taken out last year.

Better Business on Pacific Coast —Appliances Quiet

BUSINESS conditions are somewhat easier on the Pacific Coast and a more optimistic spirit prevails. Salesmen report better orders on all lines, to a degree the result of rumored price increases reacting on dangerously depleted stocks.

There is a marked improvement in the Northwest in sales of wiring materials to contractor-dealers, and this is expected to last well into the fall. Central-station buying for construction is tapering off as replacement and extension work is being completed. Domestic appliances, particularly washing machines and ranges, are moving slowly, except for such popular items as marcel and curling irons. Save for lamps and wire there have been no recent price changes. The reduced lamp prices are stimulating retail sales as dealers are seeking extra volume because of the consequent shrinkage in their contract sales realization.

Collections are fair to good and are improving, notably in the Mountain States. Announcement has been made of a large factory to be built immediately in the San Francisco Bay region to handle the increasing Pacific Coast business on electrical pole-line hardware.

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Trumbull-Vanderpoel Enlarging Bantam Factory

The Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn., is adding two more floors to its factory on account of the recent increase in the demand for inclosed switches. About 6,400 sq.ft. of additional manufacturing space will be secured. E. F. Miner, who formerly handled central-station standardization matters from the factory, has been assigned to the sales territory covering New York State outside of the metropolitan district and expects to be established permanently in Syracuse. Mr. Miner is well known in the central-station field, having for some years managed the Litchfield Electric Light & Power Company of Bantam, Conn.

Electric Power Equipment to Have New Connection in London

The Electric Power Equipment Corporation, 412 North Eighteenth Street, Philadelphia, announces that it has made a new connection in London with the firm of Nathan & Allen, Ltd. This firm, which is one of the largest in Great Britain, acts as consulting and purchasing engineer for companies in the British Dominion. Nathan & Allen will represent the corporation in England, Australia, New Zealand and India.

Lamp Manufacturer Temporarily Enjoined

Federal Judge Lowell of Massachusetts has issued a decree for a temporary injunction restraining the Hanan Lamp Company, Inc., Danvers, Mass., from making or selling incandescent electric light bulbs under U. S. patent No. 1,018,502, issued to Just & Hanaman. The General Electric Company is the plaintiff in the case.

Changes in Cutler-Hammer Sales Organization

G. S. Crane, general sales manager of the Cutler-Hammer Manufacturing Company, Milwaukee, has announced a number of changes in the sales organization, dividing the company's products into two general classes—engineering and merchandising. T. D. Montgomery, formerly manager of the Eastern district, with headquarters in New York City, has been appointed assistant sales manager in charge of engineering sales. He is now at the main office in Milwaukee.

A. H. Fleet, formerly manager of the specialty department at Milwaukee, now has charge of the sale of all merchandising products of the company.

C. W. Yerger, formerly manager of the Boston office, is now manager of the Eastern district, assuming the former duties of Mr. Montgomery. J. M. Fernald is taking Mr. Yerger's place as manager of the Boston office.

A Milwaukee branch sales office has been opened in charge of J. U. Heuser, formerly of the Chicago office. This Milwaukee branch office is part of the district including Detroit, St. Louis and Chicago, the latter being the main office, of which H. L. Dawson is manager.

M. S. Wright Company Announces Dissolution of Pneuvac Company

The M. S. Wright Company, since 1908 manufacturer of the Sweeper-Vac vacuum cleaner at Worcester, Mass., announces the dissolution of the Pneuvac Company that has heretofore acted as sales agent for the Wright company. The Pneuvac company was owned and controlled by the Wright company, and the dissolution has been accomplished solely to simplify the conduct of the business. Henceforth all business of the Pneuvac company will be carried on by the Wright company. No change of personnel or organization has been effected.

Great Western Power Equipment Order Goes to Westinghouse

A contract has recently been awarded to the Westinghouse Electric & Manufacturing Company by the Great Western Power Company of California for the purchase of two motor-generator sets, three balancer units and automatic alternating-current switching equipment. The 500-kw. motor-generator sets have three bearings and consists of an 11,500-volt, three-phase, 60-cycle, 720-r.p.m. synchronous motor; a 125-volt direct-connected exciter for the motor and a 500-kw., 550-volt shunt-wound, three-wire direct-current generator. In addition to the usual shunt field, each generator has a 20 per cent auxiliary shunt field directly connected to the excitation bus, energized by a 7½-kw. motor-driven exciter.

The alternating-current switching equipment is of the automatic periodic reclosing type and is used on the two 110,000-volt lines that come into the Clayton substation, where this equipment will be installed.

Research Engineering Organizing Corporation for Foreign Interests

A new corporation through which all of its foreign interests will be handled is being organized by the Research Engineering Corporation, 392 Fifth Avenue, New York. Edward F. Chandler, vice-president and consulting engineer of the corporation, is in charge of this work and expects to so co-ordinate the functions of the two companies as to afford a mutually valuable exchange of engineering data. The company also announces that it is engaged in the development of a number of important industrial inventions.

Gilbert Calyer Tompkins, president of the corporation, who is now in London, will confer with engineering and industrial interests relative to the introduction abroad of the "Recony" unit system for the motor operation of gate and globe valves.

Expanding Business Takes States Company Into Larger Quarters

The States Company, formerly of 72 Francis Avenue, Hartford, Conn., has moved to 19 New Park Avenue, in the same city, where it will occupy nearly twice the floor area previously used. C. P. Upson, sales manager, states that at the same time the office staff has been increased 40 per cent and the manufacturing personnel 10 per cent. The company's sales of test tables to July 15 almost equal the total sales of 1923 in this line and the general business is running slightly ahead of a year ago. L. Brandenburger, 419 Dooley Building, Salt Lake City, has been appointed representative for Utah, southern Idaho and western Wyoming.

The Hoover Company, Ltd., Hamilton, Ont., manufacturer of "Hoover" suction sweepers for Canadian and export trade, has doubled its facilities to take care of the increasing demand.

The Franklin Electric Company, 15 North Seventh Street, Philadelphia, dealer in electrical equipment and supplies, has purchased property at 50-52 North Seventh Street, 50 ft. x 100 ft., with existing building, for a consideration of $76,000, and plans to occupy at an early date.

The General Electric Company will soon proceed with the construction of its proposed four-story-and-basement factory branch and distributing plant at Mulberry, Peach and Third Streets, Cincinnati, to be 128 ft. x 185 ft., estimated to cost approximately $500 000. A general contract has been let to the Ferro Concrete Construction Company, Cincinnati.

The Hayes Electric Company, 34 Taylor Street, Springfield, Mass., manufacturer of electric furnaces, ovens, etc., will soon lay foundations for a three-story and basement building on Taylor Street, 50 ft. x 98 ft., to cost approximately $45,000, for which a general contract has been let.

The Bryant Electric Company, Bridgeport, Conn., has just placed on the market a lock type tumbler switch which may be used in connection with Bryant standard flush tumbler switch plates. The company has also added to its electrical wiring devices a new line of shallow push button switches known as the "5,500 line," which are made in single-pole, double-pole, three-point and four-point styles. The depth of these switches is 1 3/32-in.

The Pacific Coast Electric Sales Company, 331 Rialto Building, San Francisco, Cal., has been organized and desires to represent several reliable manufacturers of electrical or radio products.

New Trade Literature

STREET LIGHTING.—"Better Street Lighting with Greater Safety" is the title of a booklet issued by the Kuhlman Electric Company, Bay City, Mich., which describes the "Kuhlman" multiple-street lighting systems.

FURNACE ARCHES.—The M. A. Hofft Company, 814 West Washington Avenue, Indianapolis, Ind., has issued a booklet entitled "Increasing Today's Profits with Better Furnace Arches," in which it calls attention to the advantages of the "National" furnace arches, including the lower maintenance costs, ease of installing and replacements, etc.

PLANER MOTORS.—The Reliance Electric & Manufacturing Company, Ivanhoe Road, Cleveland, is distributing bulletin No. 2,016, giving information on its "Type T" heavy duty Reliance planer motors for reversing service.

SPUR GEAR SPEED TRANSFORMER.—The Hill Clutch Machine & Foundry Company, corner Breakwater Avenue and West Sixty-fifth Street, Cleveland, is distributing Bulletin T-220, describing its "Industrial Type" spur gear speed transformer.

STEEL-CLAD TRANSFORMERS.—Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is distributing publication known as C 1,699, entitled "Steel-Clad Distribution Transformers, Type SK," which describes a newly designed type of transformers. While this pamphlet is of interest to all connected with the electrical industry, it is of especial interest to power plant and transmission engineers.

BEARINGS FOR ELECTRIC MOTORS.—"Rollway Bearings for General Purpose Electric Motors" is the title of a folder issued by the Rollway Bearing Company, Inc., Syracuse, N. Y., which includes a summary of recommendations made for this type of motor, made by a joint committee of the ball and bearing manufacturers to the Power Club Committee, January 8, 1924.

CONNECTORS.—The Crouse-Hinds Company, Syracuse, N. Y., is distributing bulletin No. 2,056, describing its "CG" series connectors. Bulletin No. 2,058 issued by the company covers its "Wedgtite" pipe hangers.

THEATER SWITCHBOARDS.—"Theater Switchboards" (circular 1,702), is the title of a new publication issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., describing its line of theater lighting-control equipment and announcing its new multi-preset board. With this board all the lighting effects for every scene of a theatrical production may be set up in advance and remain undisturbed for the entire run of the production.

TRAFFIC SIREN.—The Inter-State Machine Products Company, Inc., Rochester, N. Y., is distributing bulletin No. 603, covering its type "F" Sterling traffic siren.

UNDERFEED STOKER.—The Sanford Riley Stoker Company, Worcester, Mass., has issued publication No. 83, covering its "Lateral Retort" underfeed stoker. It also contains illustrations showing stoker installations in a number of boiler plants.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An agency is desired in Johannesburg, South Africa (No. 11,121), for electrical refrigerators, freezers, vacuum cleaners, washing machines, ironers and dishwashing machines.

An agency is desired in Alexandria, Egypt (No. 11,178), for telegraphones and sewing machines with motors for tailor shops and factories.

An agency is desired in Sydney, Australia (No. 11,134), for glassware, including lamp shades, globes, etc.; also for electrically operated razor-blade-sharpening machines.

ELECTRICAL EQUIPMENT FOR MONTEVIDEO, URUGUAY.—Tenders will be received by the State Electric Works of Montevideo, Uruguay, until Sept. 5 for mild-steel bars; until Sept. 15 for 37,750 iron supports for aërial wires. Tenders will also be received by the State Electricity Supply Works, Montevideo, until Sept. 10 for white-varnished porcelain insulators; also until Sept. 23 for 60,000 metallic and carbon-filled filament lamps.

MOTOR - GENERATOR SETS FOR TELEPHONE EXCHANGE, SYDNEY, AUSTRALIA.—Tenders will be received by the Postmaster "General," Department, Sydney, Australia, until Sept. 15 for motor-generator sets for telephone exchange.

CATALOGS FOR ELECTRIC GENERATING EQUIPMENT, ETC., DESIRED IN PALESTINE.—Catalogs covering generating equipment, transformers, switch gear, meters, heating appliances and lighting devices, according to *Commerce Reports*, are desired in connection with electrical development following upon the Zionist settlement work in Palestine.

New Incorporation

THE ROANOKE-STAUNTON RIVER POWER COMPANY, Roanoke, Va., has been granted a charter to generate and distribute electricity. The officers are S. D. Ferguson, president and James A. Martin, secretary.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

SANFORD, ME.—The York Utilities Company is building new terminals, including an express office, carhouse and repair shop, at Sanford and is completing a loop of track through Sanford and Springvale.

WATERBURY, VT.—The installation of a municipal electric plant is under consideration. It is proposed to utilize the power at the old Randall & Roberts mill.

NEW BEDFORD, MASS.—The New Bedford Gas & Edison Light Company is building an equipment distributing works and repair shop on Coffin Street, to cost about $42,000.

Middle Atlantic States

BEAVER DAMS, N. Y.—The Beaver Dams Light & Power Company has applied to the Public Service Commission for permission to erect electric transmission lines in the towns of Dix, Orange and Catlin, and also for authority to issue securities to cover the cost of the line. It is proposed to enlarge the present plant and extend the service. H. B. Owen is president.

BINGHAMTON, N. Y.—The Binghamton Light, Heat & Power Company has acquired the Susquehanna (Pa.) County Light & Power Company and plans extensions and improvements, including additional transmission lines. The company also contemplates an addition to its main generating plant at Johnson City.

CATTARAUGUS, N. Y.—The Cattaraugus Electric Light & Power Company has applied to the Public Service Commission for permission to erect transmission and distribution lines in the town of Otto and East Otto, where it has been granted franchises.

DUNKIRK, N. Y.—The Republic Light, Heat & Power Company is erecting an addition to its Lake Road power plant. Some new equipment, it is understood, will be installed.

HAMBURG, N. Y.—The Depew & Lancaster Light, Power & Conduit Company, Lancaster, plans to erect an emergency high-tension line to Hamburg. The Village Board has recently entered into a five-year contract with the company for lighting the village.

HIGHLAND, N. Y.—Steps have been taken by the Chamber of Commerce to secure an extension of the electric lighting system to Oakes.

ITHACA, N. Y.—The New York State Gas & Electric Corporation has applied for permission to exercise electric franchises in towns and villages in six counties and to begin construction of distribution system in each community as follows: Hamilton, Lebanon, Fallsburgh, Marshall, Kirkman, Stamford, Newfield and Columbus. The company has also asked for authority to exercise electric franchises in the towns of Spencer and Neversink and to extend its transmission lines to the town of Thompson to supply service there.

KINGS PARK, N. Y.—Bids will be received by the State Hospital Commission, Capitol, Albany, until Aug. 13 for construction, heating, sanitary and electric work for addition to power house at Kings Park (N. Y.) State Hospital.

LEROY, N. Y.—The Western New York Utilities Company contemplates rebuilding its pole lines in this vicinity and also considerable rewiring.

MIDDLEPORT, N. Y.—The Middleport Gas & Electric Company, it is reported, will soon ask for bids for the construction of a power dam on Eighteen-Mile Creek at Burt, to cost about $300,000.

MIDDLEPORT, N. Y.—Application has been made to the Public Service Commission for approval of the merger of the Middleport Gas & Electric Company and the Newfane (N. Y.) Electric Company, to be known as the Lockport & Newfane Power & Water Supply Company of Middleport. The new company owns a water-power site at Burt on Eighteen-Mille Creek, where it proposes to build a hydro-electric development. Foundations for dam have already been started. The company also asks for authority to issue $300,000 in bonds to provide funds for the proposed development.

NEW YORK, N. Y.—Bids will be received by the Board of Estimate and Apportionment, Council Chamber, Municipal Building, until Aug. 14 for work in connection with court house to be located on a site surrounded by Centre, Worth, Baxter and Pearl Streets in the borough of Manhattan as follows: Contract A, the interior finish work; B, drawn steel fixture work; C, plumbing work; D, heating and ventilating work, and Contract E, electrical work.

SHERMAN, N. Y.—The Western New York Electric Company, Batavia, plans to build a local light and power plant for commercial service.

SYRACUSE, N. Y.—The Syracuse Lighting Company has applied for permission to erect a transmission line to and an electric distribution system in Sullivan. If granted, the company proposes to extend its service from the Sullivan-Cicero town border to Bridgeport.

TROY, N. Y.—The City Council has adopted an ordinance providing for the installation of an ornamental lighting system on Catherine Avenue, Lindenwood Park and Sausse Avenue. The system will be installed by the Troy Gas Company.

WATERTOWN, N. Y.—Permission has been granted the Northern New York Utilities, Inc., to erect and maintain a high-tension transmission line from its Black River power plant near Watertown to Altmar, a distance of 35 miles. The proposed line will be built on private right-of-way.

CAMDEN, N. J.—Steps have been taken by the Thirty-second Street Association to secure a new street-lighting system on that thoroughfare and adjacent streets.

JERSEY CITY, N. J.—The Erie Railroad Company plans to build a power house at its local shops, to cost about $75,000.

JERSEY CITY, N. J.—Colgate & Company, 105 Hudson Street, the ELECTRICAL WORLD is informed, does not contemplate building a manufacturing plant or power plant in Vera Cruz, Mexico, as reported in the issue of Aug. 2.

LODI, N. J.—The United Piece Dye Works has taken out a permit for the construction of a power plant, which will supply electricity to operate its plant. The cost is estimated at $374,000.

MORRIS PLAINS, N. J.—Bids will be received at the office of the Commissioner of Institutions and Agencies, State Office Building, West Hanover Street, Trenton, until Aug. 27 for general plumbing, heating, electric installation, refrigeration, elevators, sewers and drains, and fire and water work in connection with the following buildings at the New Jersey State Hospital, Morris Plains: Reception building, classified dining room and kitchen building, male convalescent building, female convalescent building, male employees' building and female employees' building.

PLAINFIELD, N. J.—Plans are under way for the installation of an ornamental lighting system in the business district.

ERIE, PA. — The Erie Lithographing Company is planning to build a lithographing plant at Fourth and State Street, to cost about $1,000,000. All machinery will be equipped for electrical operation. Armin Schotte, Erie, is a architect.

KANE, PA.—The City Council is considering extensions to the ornamental lighting system.

PHILADELPHIA, PA.—The City Council has adopted an ordinance authorizing the Department of Public Safety, Electrical Bureau, to locate over 400 electric lamps to be erected in various wards in the city.

PHILADELPHIA, PA.—Bids will be received by the depot quartermaster, United States Marine Corps, 1100 South Broad Street, until Aug. 28 for 300 hand sets, field telephone, for local service (Schedule 70).

PITTSBURGH, PA. — The Duquesne Light Company has applied for a permit to erect a 66,000-volt transmission line across the Ohio River between Woodlawn and Legionville.

SCRANTON, PA.—The City Council has authorized the Department of Public Works to make arrangements for the installation of an ornamental lighting system on Ninth Avenue, Robinson and Jackson Streets, in West Scranton. Work will not begin until the ornamental lighting system in North Scranton and South Scranton is completed.

STILLWATER, PA. — The Stillwater-Columbia Power & Light Company, now being organized by officials of the Pennsylvania Power & Light Company, plans to erect and operate a transmission line in Stillwater Township.

BALTIMORE, MD. — Bids will be received by the Board of Awards, office of the City Register, until Aug. 13 for electric wiring and other electrical work in five buildings at the Bay View Asylum, including east and west wings of main building, laundry and three hospitals. Plans and specifications at the office of C. H. Osborne, City Hall, inspector of buildings.

WASHINGTON, D. C.—Bids will be received by the general purchasing officer, Panama Canal, until Aug. 18 for cable, wire, lamp sockets, renewable fuses conduit, ceiling fixtures, etc. (Circular 1623).

North Central States

DETROIT, MICH. — The Edmunds & Jones Corporation, Lawton Avenue, manufacturer of automobile headlights, will install electric power and heating equipment in the addition to its works, to cost about $400,000.

ASHTABULA, OHIO.—The Council has awarded a general contract for the erection of the superstructure for the addition to the municipal electric light plant, to cost about $45,000. Arrangements will soon be made for the installation of equipment.

ZANESVILLE, OHIO.—Further extensions to the street-lighting system is reported to be under consideration by the City Council.

ASHLAND, KY.—The installation of motor-driven pumping machinery in connection with proposed extensions in municipal waterworks, to cost about $300,000, is under consideration by the City Council.

ANGOLA, IND.—The Indiana Electric Utilities Company contemplates erecting a transmission line to connect Angola and Fremont with Ray, Mich. E. J. Condon is president.

CLINTON, IND.—The Wabash Valley Electric Company is considering issuing $387,000 in bonds and $186,000 in capital stock, the proceeds to be used for extensions and improvements.

INDIANAPOLIS, IND.—The Merchants' Heat & Light Company has applied for permission to issue $400,000 in securities, the proceeds to be used for extensions and improvements.

KOKOMO, IND.—The Northern Indiana Power Company has applied for permission to issue $714,000 in securities, part of the proceeds to be used for extensions and improvements in its system.

NORWAY, IND.—The Indiana Hydro-Electric Power Company has applied to the Public Service Commission for authority to issue $1,750,000 in bonds and $437,600 in capital stock, to finance the construction of a dam on the Tippecanoe River at Oakdale.

KNOX, IND.—Bids will be received by the Board of Trustees until Aug. 18 for the installation of an ornamental lighting system on a number of city streets.

CUBA, ILL.—The installation of an ornamental lighting system is under consideration by the Council.

AVOCA, WIS.—Plans have been approved by the voters for the erection of a transmission line to connect the municipal electric lighting system with the municipal electric plant at Sauk City, which purchases energy from the Wisconsin River Power Company.

BARTON, WIS.—The electric plant and distributing system of the Young America Power, Light & Milling Company, Barton, has been acquired by the West Bend (Wis.) Heating & Lighting Company. Extensions and improvements are contemplated by the latter company, which is offering an issue of $150,000 in bonds to finance the extension and for improvements.

PORTAGE, WIS.—Steps have been taken by local business men and property owners for the installation of an ornamental lighting system in the business section of the city.

REEDSBURG, WIS.—The property including water power rights of the Reedsburg Roller Mills has been purchased by the Appleton (Wis.) Woolen Mills Company. The new owners contemplate the construction of a dam and hydro-electric plant to furnish electricity for its works.

MILACA, MINN.—The Council is negotiating with the Eastern Minnesota Power Company for improvements in the street-lighting system on a number of thoroughfares. It is proposed to install new lighting units.

OWATONNA, MINN. — Contract for power station and equipment complete and an electric distribution system have been awarded by the Council to the Donovan Construction Company, St. Paul. All bids on heating system were rejected. Arthur L. Mullergren, Kansas City, Mo., is consulting engineer.

ACKLEY, IOWA.—The Council is considering making improvements to the municipal electric light plant, including the installation of additional equipment.

CHARLES CITY, IOWA. — The Cedar Valley Electric Company contemplates improvements to its system, including the installation of voltage regulators and larger feed wires, to cost about $10,000.

SIOUX CITY, IOWA.—Work has been started on the new steam electric generating station of the Sioux City Gas & Electric Company. The plans provide for an approximate ultimate capacity of 60,000 kw., of which 25,000 kw. is being installed at the present time. Powdered fuel will be used. The U. G. I. Contracting Company, Broad and Arch Streets, Philadelphia, is contractor.

ST. LOUIS, MO.—Bids will be received by the Board of Public Service, City Hall, until Aug. 12 for electric arc and incandescent lamps, to be installed on a number of streets.

BISMARCK, N. D. — Plans are under way for the construction of a power house at the City Hospital, with a 125-ft. smokestack. Keith & Kurke, Equity Building, Fargo, N. D., are architects. The Frank Tustison Company, National Life Building, Minneapolis, Minn., is mechanical engineer.

LINCOLN, NEB.—Black Brothers, operating a local milling plant, are perfecting plans for the construction of an electric generating plant on the Blue River, to cost about $60,000. It will be used for auxiliary service.

OMAHA, NEB.—Sixty miles of 66,000-volt transmission line which will tie in the Nebraska South Platte properties of the Continental Gas & Electric Corporation with the company's properties in Iowa and northern Missouri will be erected this summer and fall by the Nebraska Gas & Electric Company. Material for this line has been purchased.

COFFEYVILLE, KAN.—The Council has authorized extensions to the municipal electric power station, to include the installation of additional generating equipment, etc.

Southern States

PILOT MOUNTAIN, N. C.—The Board of Commissioners is considering an issue of $18,000 in bonds to complete the municipal electric plant.

LEXINGTON, S. C. — The Lexington Water Power Company has applied to the Federal Power Commission for permission to construct a dam (100 ft. high) in Saluda River, about ¼ mile below the mouth of Bear Creek. The power house at the dam will be equipped with four generating units having a total capacity of 45,000 hp.

WILLISTON, S. C.—The Edisto Public Service Company, Denmark, which has been granted a franchise in Williston, will take over and operate the municipal electric light plant.

ATLANTA, GA.—A special committee has been appointed by the City Council to make investigations relative to carrying out a project for improvements to the waterworks system, which include a dam and power plant on the Chattahoochee River. The cost is estimated at $2,500,000.

MILLEDGEVILLE, GA.—The Milledgeville Lighting Company, it is reported, plans extensions in its system. Permission has been asked to issue $150,000 in stock, part of the fund to be used for expansion.

KINGSPORT, TENN.—Plans for the proposed local mills of the American Printing Company, Fall River, Mass., include a power plant. The cost of the entire project is estimated at about $350,000.

BIRMINGHAM, ALA.—The Alabama Power Company has applied for permission to extend its transmission lines from Greenville to Georgiana, Chapman and Fort Deposit.

MOBILE, ALA.—The City Council has authorized plans for extensions and improvements in the fire-alarm and police-alarm systems.

MOBILE, ALA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 22, for removal of the present hand-power dumb waiter, changes in hoistway, etc., and the installation of an electric dumb waiter in the United States Marine Hospital, Mobile. For details see Searchlight Section.

BALDWIN, MISS. — The Mississippi Power & Light Company, Jackson, which has acquired the municipal electric light plant, plans to erect a transmission line (about 20 miles long) to connect Baldwin with Tupelo, which will also tie in the town of Guntown and Satillo.

MAMMOTH SPRINGS, ARK.—The Central Power & Electric Company, Chemical Building, St. Louis, which has acquired the plant and holdings of the Mammoth Spring Electric Light & Power Company, plans improvements to the system, to cost about $1,000,000.

CHENEYVILLE, LA.—The installation of a municipal electric light and water plant, to cost about $40,000, in Cheneyville is under consideration. Further information may be obtained from F. P. Joseph, Glenmora, La., consulting engineer.

BROKEN BOW, OKLA.—The name of the Broken Bow Light & Power Company has been changed to the McCurtain County Light & Power Company, and the capital stock increased from $5,000 to $50,000.

HOLLIS, OKLA.—The Hollis Light & Ice Company contemplates installing a 150-hp. Fairbanks Morse engine and generator, directly connected. Anna M. Miller is owner and manager.

CANYON, TEX.—The Canyon Light & Power Company contemplates erecting a transmission line from Amarillo, a distance of 18 mile. J. Arnold is owner and manager.

FREEPORT, TEX.—The installation of a new generator and switchboard is contemplated by the Freeport Light, Water & Ice Company this year. J. H. Ross is superintendent.

HILLSBORO, TEX.—Surveys are being made by the Texas Power & Light Company for a transmission line from Eastland, via Walnut Springs to Hillsboro.

SAN ANGELO, TEX.—The installation of an ornamental lighting system on several streets is under consideration by the city officials.

Pacific and Mountain States

NEWPORT, WASH. — Application has been filed with the Supervisor of Hydraulics by A. F. Horton, W. H. Wright and V. P. Campbell, all of Newport, for a permit to appropriate 150 second-feet of water from Bend Lake in Pend Oreille County for a hydro-electric project and irrigation purposes. The water will be used at a 150-ft. head and will be taken direct from the lake by a pipe line, no diversion or impounding dam being necessary. It is proposed to develop about 100 hp. at a cost of about $25,000.

SEATTLE, WASH. — Appropriations of more than $500,000 for improvements to the municipal light and water system have been proposed to the City Council. Authority to spend $300,000 from the city light fund to build a warehouse at Fourth Avenue South and Spokane Street has been asked by J. D. Ross, superintendent.

SPOKANE, WASH.—The Council is reported to have awarded contract for the installation of an improved lighting system on Howard Street to the Washington Water Power Company, at a cost of about $91,000.

SPOKANE, WASH.—Surveys are being made by the Washington Water Power Company for the erection of a high-tension transmission line (110,000 volts) from Long Lake to Spokane.

TAUNTON, WASH. — The Washington Water Power Company has applied for permission to erect a transmission line from Neppel to Taunton.

TROUT LAKE, WASH.—The Supervisor of Hydraulics has granted a permit to the Trout Lake Power & Light Company authorizing it to appropriate 350 second-feet of water from White Salmon River for a hydro-electric plant. The plans provide for a development of 3,000 hp.

ONTARIO, ORE.—Surveys are being made by the Idaho Power Company for an extension of its 132,000-volt transmission line from Ontario to Gypsum.

PORTLAND, ORE. — The Columbia Valley Power Company, Portland, has secured permission to build two hydro-electric plants one on the Jefferson River, near Metolius, and the other on the Deschutes River, near Pelton.

BURBANK, CAL.—Plans for the proposed plant of the Soda & Potash Company, Loew State Building, Los Angeles, to be erected on Sonora Street, to cost about $100,000, include a power house. The Kennard Engineering Company, Hollingsworth Building, Los Angeles, is architect and engineer.

HAWTHORNE, CAL.—The plant of the Hawthorne Electric & Water Company is reported to have been purchased by the city.

LONG BEACH, CAL.—The Pacific Steel Manufacturing Company plans to construct a power house at its proposed local mills. J. C. Schindler is chief engineer.

OAKLAND, CAL.—The City Council has appropriated $22,500 for the installation of an underground conduit system in connection with an ornamental lighting system in the Lake Merritt street. J. F. Byxbee, Jr., is city engineer.

PALO ALTO, CAL.—The City Council plans to install an ornamental lighting system on Hamilton Street. J. F. Byxbee, Jr., is city engineer.

SAN ANSELMO, CAL.—The Board of Trustees has instructed the engineer to prepare plans for paving and improving Morningside Court, to cost about $100,000. The work will include pavements, curbs, gas and water mains, electroliers, electric light and telephone conduits.

SAN DIEGO, CAL.—The Potter Radiator Corporation, 5946 Pasadena Avenue, Los Angeles, contemplates the construction of a power house at its proposed local plant. The entire cost is estimated at $500,000.

CRAIG, COL. — The Craig Light & Power Company contemplates extensions to its plant.

DEMING, N. M.—The installation of a hydro-electric power plant at the Elephant Butte Dam, for service in the Mimbres Valley irrigation district, with transmission lines through this section, is under consideration. The local Chamber of Commerce and J. W. Taylor, president of the New Mexico Irrigation District, are interested in the project.

Canada

POWELL RIVER, B. C.—The Powell River Power Company, Ltd., is planning extensions and improvements to its plant and the town site of Powell River, involving an expenditure of about $600,000. Contract has been awarded for raising the dam at the hydro-electric plant, and construction of a new wharf, to cost about $350,000.

ANTIGONISH, N. S.—The ratepayers have approved a proposal to establish a municipal electric plant, to cost about $80,000. The plans provide for the construction of a hydro-electric plant near the James River Falls and also the purchase of the existing local system and central station, which is operated by an oil engine. F. W. W. Daone, Halifax, is consulting engineer.

REGINA, SASK.—Bids, it is reported, will be received by the City Commissioner until Sept. 2, for one 5,000-kw. steam turbine generator, three-phase, 60 cycles, 2,300 or 4,000 volts, and one surface condenser for 70,000 lb. steam per hour and 29 in. vacuum. E. W. Bull is manager of light and power department.

Electrical Patents

Announced by U. S. Patent Office

(Issued July 1, 1924)

1,500,088. IGNITION INDICATING AND DETECTING DEVICE; M. J. Neuner and A. A. Habermann, North Bergen, N. J. App. filed July 27, 1922. For an automobile or similar mechanism.

(Issued July 8, 1924)

1,500,181. ARMATURE AND COIL WINDING MACHINE; P. E. Chapman, St. Louis, Mo. App. filed Dec. 14, 1914.

1,500,211. PANELBOARD AND PANELBOX CONSTRUCTION; H. F. Starrett, Chicago, Ill. App. filed June 27, 1919. Dead front type.

1,500,219. STORAGE BATTERY GRID; R. C. Benner, Bayside, N. Y. App. filed May 2, 1922. Protective coatings.

1,500,220. SEPARATOR AND METHOD OF MAKING THE SAME; R. C. Benner, Bayside, N. Y. App. filed May 2, 1922. Of fiber with a bonding material.

1,500,221, 1,500,222. STORAGE CELL OR BATTERY AND ELECTRODE THEREFOR; R. C. Benner, Bayside, N. Y. App. filed May 3, 1922. Miniature type adapted for use in flashlights, etc.

1,500,239. SYNCHRONOUS TRANSMISSION SYSTEM FOR GYROSCOPES, ETC.; A. P. Davis, Far Rockaway, N. Y. App. filed May 26, 1919.

1,500,243. SUBMARINE SOUND TRANSMITTER; J. H. Hammond, Jr., Gloucester, Mass. App. filed Feb. 20, 1918.

1,500,287. STORAGE BATTERY; R. W. Wales, Auburndale, Mass. App. filed May 5, 1921. With specially arranged separators.

1,500,323. OIL SHALE EXTRACTION PROCESS; R. W. Jenkins, Richmond, Cal. App. filed May 12, 1921.

1,500,325. SELF-WINDING GONG; W. H. Kallenback and C. C. Bertsch, Boston, Mass. App. filed Nov. 29, 1919. Adapted for the sounding of fire-alarm or other signals.

1,500,353. SEPARATOR; T. A. Willard, Cleveland Heights, Ohio. App. filed Feb. 17, 1921. For storage battery, composed of porous material and a binding agent.

1,500,382. TEMPERATURE CONTROLLING SYSTEM; J. E. Gannon and M. W. Ward, Erie, Pa. App. filed Oct. 19, 1922. For heating systems in buildings.

1,500,448. STORAGE BATTERY; V. C. Goodridge, Chicago, Ill. App. filed Jan. 23, 1922. Lead type.

1,500,476. INTERFERENCE PREVENTION IN RADIO RECEPTION; F. K. Vreeland, Montclair, N. J. App. filed July 28, 1920.

1,500,477. DRY BATTERY; H. E. Warncke, Norwalk, Conn. App. filed Aug. 1, 1922. With control of leakage of moisture from the interior of a dry cell.

1,500,482. ILLUMINATED TARGET; W. J. Barrett, Bridgeport, Conn. App. filed Nov. 14, 1923. For gunfire practice.

1,500,486. TELEGRAPH TRANSLATOR AND CIRCUITS THEREFOR; A. D. Cardwell, Brooklyn, N. Y. App. filed Feb. 2, 1917.

1,500,498. SNAP CLAMP FOR TAPPING ELECTRIC CONDUCTORS; T. F. Johnson, Jr., Atlanta, Ga. App. filed Nov. 13, 1918.

1,500,499. CLAMP FOR ELECTRICAL CONDUCTORS; T. F. Johnson, Jr., Atlanta, Ga. App. filed Jan. 10, 1923.

1,500,521. DIRECTION SIGNAL; P. Z. Nicholas, Charlestown, Mass. App. filed Oct. 6, 1922. For use on automobiles.

1,500,528. VARIABLE ELECTRIC PLATE CONDENSER; F. F. Rathbun, Jamestown, N. Y. App. filed July 7, 1922.

1,500,552. MULTIPLEX TRANSMISSION SYSTEM; L. Espenschied, Hollis, N. Y. App. filed June 17, 1919. In which carrier currents are used for the transmission of signals.

1,500,553. HARMONIC SUPPRESSOR; L. Espenschied, Hollis, N. Y. App. filed Sept. 27, 1919. In systems arranged for the multiplex transmission of a plurality of carrier currents.

1,500,593. CROSSBAR LINE SWITCH; C. D. Richard, New Brighton, N. Y. App. filed April 18, 1921. Used in automatic telephone exchange systems for the purpose of connecting calling lines with trunk lines.

1,500,601. TRAFFIC SIGNAL FOR MOTOR VEHICLES; H. L. Brewster, Somersworth, N. H. App. filed Nov. 29, 1922. Mounted on vehicle.

1,500,603. ROTARY CIRCUIT CONTROLLING DEVICE; C. W. Burger, Washington, D. C. App. filed Feb. 20, 1922. Where a contact finger or arm engages a rotary contact drum for the purpose of producing intermittent impulses.

1,500,626. SUPPORTING INSULATOR; W. D. Kyle, Milwaukee, Wis. App. filed July 22, 1922. For securing a plurality of wires.

1,500,641. ELECTRICAL CONNECTOR; G. O. Sabourin, West Brighton, N. Y. App. filed Oct. 1, 1920. For making temporary and emergency connections to duplex wire for the operation of lamps, portable electric tools, etc.

1,500,663. METHOD AND MEANS FOR REPLACING BATTERY POSTS AND THREADS; J. C. Ball, Kinsale, Va. App. filed Jan. 6, 1923.

1,500,696. FOOT WARMER; H. F. White, Denver, Col. App. filed Nov. 9, 1922. Hollow cylindrical member, in which an electric lamp is disposed.

1,500,706. SIGNAL; B. B. Isom, Near Acton, Tenn. App. filed April 5, 1922. Signal arranged to display a sign, as for announcing the presence of burglars in banks, etc.

1,500,785. HIGH FREQUENCY SIGNALING SYSTEM; E. F. W. Alexanderson, Schenectady, N. Y. App. filed Aug. 29, 1921. Telegraphic system.

1,500,805. VAULT PROTECTION SYSTEM; J. J. Duffie, Berkeley, Cal. App. filed March 3, 1921. With alarm.

1,500,814. LINK INSULATOR; E. M. Hewlett, Schnectady, N. Y. App. filed Sept. 14, 1921. Dead-end type for high potential lines.

1,500,825, 1,500,826. ELECTRIC MOTOR MECHANISM; G. R. Kunkle, Elyria, Ohio. App. filed Dec. 16, 1921. For driving the turntable of a phonograph.

1,500,827. COIL SYSTEM; R. H. Langley, Schenectady, N. Y. App. filed July 22, 1922. Inductance coil and support.

1,500,834. METHOD OF AND APPARATUS FOR MODIFYING THE CHARACTERISTICS OF ASYNCHRONOUS DYNAMO-ELECTRIC MACHINSE; C. MacMillan, Schenectady, N. Y. App. filed June 7, 1922.

1,500,851. SYSTEM OF MOTOR CONTROL; C. F. Scott, Yonkers, N. Y. App. filed Feb. 20, 1923. For starting, accelerating, reversing and stopping under the control of master switch mechanism.

1,500,860. ELECTRIC CONTROL SYSTEM; S. Yo, Tokyo, Japan. App. filed May 17, 1922. Comprising a plurality of alternating-current motors, the speeds of which are responsive to the frequency of the supply source.

1,500,892. RADIOGRAFONOLA; F. J. Renner, Madison, Wis. App. filed April 18, 1922. Combination radiophone and talking machine equipment and cabinet.

1,500,912. LAMP FOR VEHICLE HEADLIGHTS AND THE LIKE; L. G. Williams, Godrergraig, Wales. App. filed Oct. 23, 1923. To obviate the dazzling effect.

1,500,935. MACHINE FOR WINDING WIRE UPON SPOOLS; A. G. Hoovens, Goshen, N. Y. App. filed May 26, 1923.

1,500,954. MANUFACTURE OF LEAD ALLOYS; W. Mathesius and H. Mathesius, Charlottenburg, Germany. App. filed Oct. 21, 1922.

1,500,967. DIRECTION SIGNAL FOR VEHICLES; F. F. Thomsen, Omaha, Neb. App. filed Aug. 23, 1922.

1,500,976. THEFT ALARM CARRIER; E. A. Wiese, West Hoboken, and O. A. Wiese, Union Hill, N. J. For the protection of carrying cases employed for transporting valuables.

1,500,984. WRAPPING MACHINES; J. Derry, Medford, Mass. App. filed May 9, 1923.

1,500,998. VEHICLE SIGNAL; C. A. Kuhn, Fork, N. Y. App. filed Feb. 20, 1922.

1,501,023. PROCESS AND APPARATUS FOR FORMING METAL OBJECTS; E. S. Goodspeed, Detroit, Mich. App. filed Aug. 25, 1920.

1,501,029. LIGHTING FIXTURE; H. R. Sargent, Schenectady, N. Y. App. filed March 28, 1921. Detachable electrically and mechanically from the wall portion.

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1,501,033. TELEPHONE EXCHANGE SYSTEM; W. P. Albert, East Orange, N. J. App. filed May 19, 1921. In which machine switches are employed for the extension of connections.

1,501,046. AUTOMATIC CONTROL FOR CHARGING SECONDARY BATTERIES; C. L. Goodrum, New York, N. Y. App. filed Dec. 22, 1920. Automatic power and light system.

1,501,049. PROCESS FOR PLATING STAINLESS STEEL AND ARTICLES PRODUCED THEREBY; A. Harper, Bristol, Conn. App. filed Dec. 24, 1921.

1,501,058. SHIELD FOR ELECTRIC WELDING MACHINES; J. W. Meadowcroft, Philadelphia, Pa. App. filed April 17, 1920. To protect the operator.